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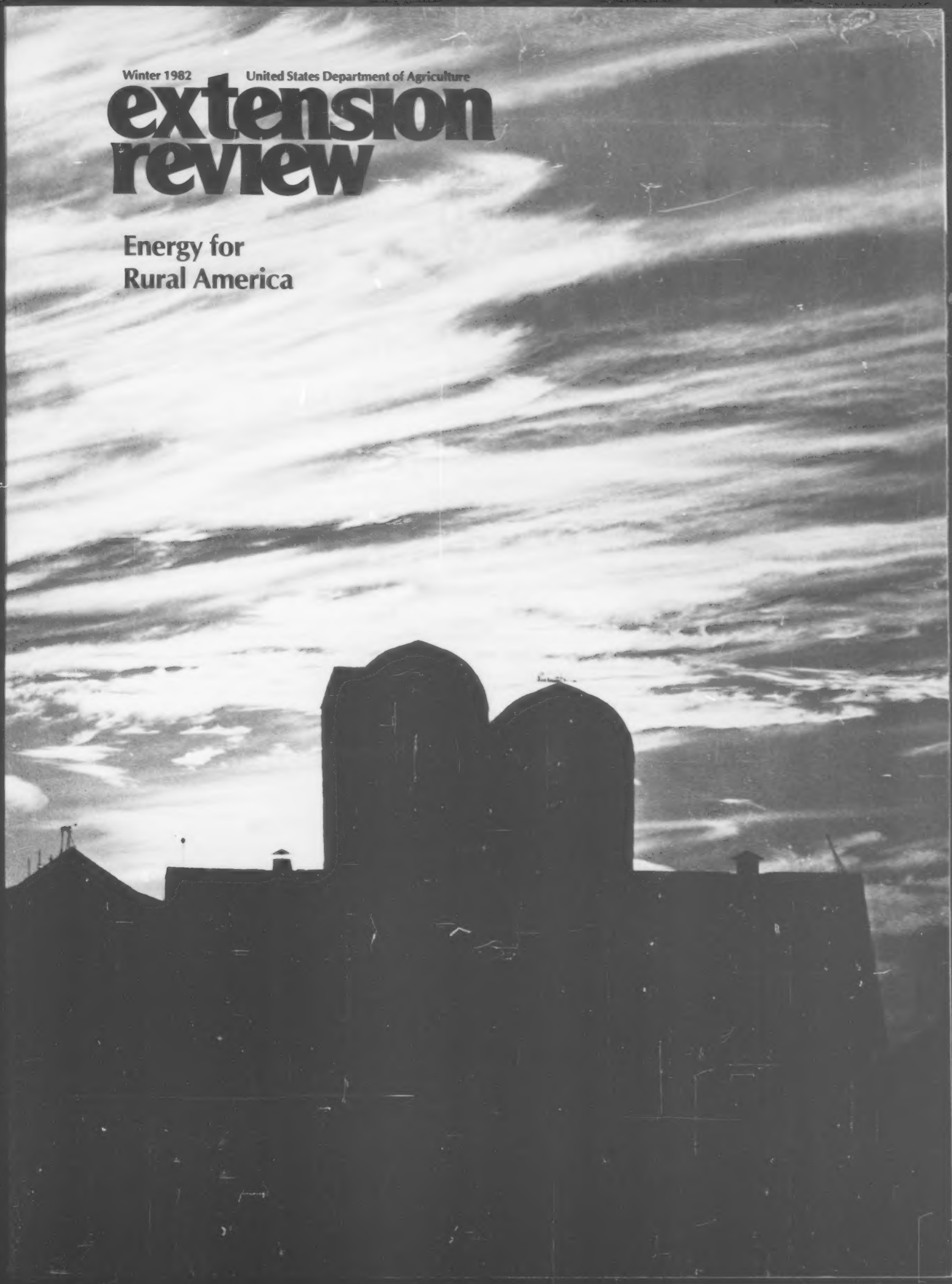
extension review

Energy for Rural America



review

Energy: Will There Be Enough?

What are the alternatives?

All Americans are concerned about the rapid increase in energy costs and the prospect for continued increases. Many are frightened by the prospect of not having enough energy at a price they can afford. Whether or not they believe there is an energy shortage is debatable. The cost increases are real!

Analysis of the concerns and problems confronting citizens reveals the vital importance of the need for them to understand the energy-economic situation and future projections to make appropriate decisions and adjustments for the future. To make changes, people must become more knowledgeable about energy resources, the rapid rate of depletion, and projected increases in cost of energy. Often the differences between good decisions and costly mistakes is the information, or the lack of it, on which the decision is based.

The challenge for the Cooperative Extension System for the remainder of this century will be to reach consumers with information that will help them make sound decisions in a changing economy and live in a society that must adjust to limited resources and to a less energy intensive lifestyle for this and future generations.

While experts may disagree on how long known energy sources will last, the facts are clear:

- Known sources of energy are limited.
- We are using energy faster than nature can produce it.
- American lifestyles require astonishing amounts of energy.
- Our national security depends upon the availability of energy.
- Energy is necessary to maintain our food and fiber system.
- Energy costs continue to increase.

In our highly industrialized society, the availability of energy determines the availability of goods and services, employment, and quality of life in our home, community, and country. No matter who we are or where we live, the availability of energy, or the lack of it, touches our daily lives.

The population in the United States makes up approximately one-sixth of the world's population yet accounts for one-third of the world's energy used each year. Current lifestyles have been built on the premise that energy resources are abundant and inexpensive. Consumption has increased nearly fourfold since 1950.

All sectors of the economy must evaluate the impact and devise ways to utilize the known energy sources more efficiently to extend the supply, in order to gain time until new sources and/or new forms of energy are available.

Conservation is the least costly, more environmentally safe, most readily available source of energy. It is cheaper to save energy than to find new sources. Conservation must be interpreted not as doing without, but as using less to accomplish the same tasks or getting more work from the energy we do consume. Conservation alone cannot solve the problem. We must encourage and support research and the development of new or alternate energy sources that will be economically sound, environmentally safe, and socially acceptable. This will require money and time. Tradeoffs will have to be made; we can no longer have our cake and eat it too.

Progress is being made, both in cutting back on waste and in developing other sources. The cost of energy continues to take a larger part of the operating budget each year. This increase can be offset, somewhat, by improved management and application of new technologies.

Cooperative Extension programs can make a significant difference

by focusing on the following:

- Help eliminate practices that are inefficient and wasteful.
- Teach decisionmaking for potential conservation in the home, on the farm, or in the community.
- Provide research-based information on alternate resource use.
- Help people cope with emergency situations.
- Assist in managing expenses resulting from increases in energy prices.

With this issue of *Extension Review*, we take a good look at ways various states tackle the problems of rising energy costs. In Nebraska, irrigation scheduling—applying the precise amount of water at just the right time for economic crop production—will be a reality for nearly all 7.4 million acres of irrigated farmland, predicts Paul Fischbach. David McCowan, in the chilly Northwest, hasn't paid his water heating bill in 3 years and the authorities are after him—for some hints on how he does it.

Extension agents from all over the country and the people they work with are proving they can teach us all a few things about conserving energy. In fact, that's exactly what they're doing. They conduct workshops, conferences, and home energy audits; publish materials on a wide variety of practical cost-cutting measures; and bring area citizens and local government together as a team. You can't ask for more than that. But we did, so they sent us their stories.

Glenda Pifer, Energy Coordinator,
Extension Service- USDA

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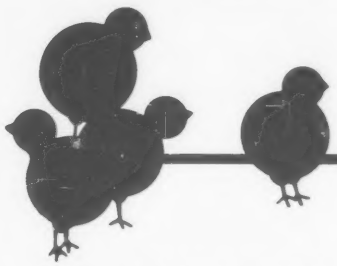

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Shrimp Boats Still A'Steaming As Computer Cuts Fuel Costs

James Booth
Writer
Mississippi Cooperative Extension Service

Rapid diesel fuel price increases have forced many Gulf Coast shrimpers out of business, but new facts on fuel management may now help some of those who have held out.

The information is coming from studies of fuel use conducted on board shrimp boats by professionals from the Sea Grant Advisory Service of the Mississippi Cooperative Extension Service.

"We're trying to classify the activities of the commercial fishing industry," says David Veal, head of the Sea Grant Advisory Service. "We want to determine how much time is spent fishing, going from port to port or between fishing areas."

Veal is using special computer equipment on board to monitor the use of diesel fuel 24 hours a day so that fuel use can be measured at every phase of the shrimping process.

"Obviously, fuel consumption rates are different when going from the port to the fishing area than while actual trawling is taking place," Veal says.

To help accomplish the project, Veal also recruited Tommy Schultz, owner and captain of the Biloxi shrimp boat "Reva Rose." As the "Reva Rose" goes about her routine shrimping chores off the Mississippi coast, Veal's computer is hard at work in the engine room.

Costs Conflict

Rising fuel costs pose a difficult problem for shrimpers, because fishermen have faced a 900-percent increase in the price of fuel in the past 8 years. Unfortunately, the price of their catch has not risen accordingly.

"In 1973, fuel was 11 cents a gallon," said Capt. Schultz. "In six months it went to 21 cents a gallon. The price of shrimp was about 80 cents a pound, and that was fine until 1976.

"Then the cost of fuel ran wild. It went to 70 and 80 cents and on to $1.17, the price it is today. The price of shrimp has remained about 80 cents a pound. At 90 cents a gallon, vessel owners lose 1 cent per pound."

"This fuel consumption program could make the difference between survival and going out of business for shrimp fishermen," Veal says. "Fuel costs for the fishing industry have gone from $10,000 or $12,000 a year to $80,000 or $100,000 a year per vessel in the past decade.

"When you have a vessel that will take on 20,000 gallons of diesel fuel a month and a fixed resource to fish from, the difference in staying in business and not being in business is the ability to manage fuel consumption."

The computer often can help shrimpers save more than a hundred gallons of fuel a day without any measurable loss in production.

"We can save a lot of money just by cutting down on engine power," Capt. Schultz said. "We're going to have to cut down on running from place to place and stick closer to home. If we move our operation, we're going to have to move it to an area we decide on and stay there." he says. "We used to be able to run back and forth with our shrimp, but we can't anymore. We have to unload at the nearest place for the best possible price we can get."

"When shrimp are available, we are going to have to put in every single day we can in the Gulf to make it pay for us," Capt. Schultz says.

Production Practices

Marginal production practices must be cut altogether, or shrimpers can prepare to go out of business. That is a hard, but accurate, reflection on

the state of today's shrimp industry. But the results of the computer's work are showing up in fuel dollars saved every day.

"One of the observations that we have made already is the difference in efficiency between two different nets," Veal says. "Typically a Gulf boat will use two nets. In the last 2 or 3 years, there has been a trend to go toward what are called 'quad trawls,' two small nets pulled on each side of the boat."

"Although we are pulling four nets, in many cases we actually have less fuel consumption and a larger catch," Veal says. "The difference is 4 or 5 gallons an hour. This 4 or 5 gallons an hour for 24 hours a day is a lot of money in a year's time."

Saving fuel is the primary object of the computer's work, and it seems to be doing the job well.

Capt. Schultz says that if he had the money, he'd buy the computer. "That is how much I think of it," he says. "It will show us where we are making errors. Correcting these errors can save fuel and money."

Savings Possible

Just how much money can be saved on fuel by following the computer results?

"With the information we are gaining from this, and good fuel management techniques, an individual vessel owner can save as much as 15 percent of his fuel bill," Veal says. "At $1 a gallon, we are talking about $10,000 to $15,000 a year."

The Gulf Coast shrimp industry still faces many problems, and the findings on board the "Reva Rose" are still being distributed to shrimpers. Others may not be as receptive as Capt. Schultz, but one fact remains: A much higher degree of professional management will be required to survive in the shrimping business.

Conservation Tillage—The Time is Now

Stu Sutherland
Public Information Officer
Extension Service, USDA

No-till farming cuts down dramatically on the energy necessary to prepare a field for planting. Also, soil erosion is reduced by leaving a residue of the previous crop on the surface to protect the soil from water and wind.

During the last decade there has been a dramatic upswing on the part of farmers to adopt the practice of no-till farming. Of the various land management practices to simultaneously control soil erosion and enhance environmental quality, conservation tillage is considered to be the single most effective method, and the least costly in time and energy, both of which mean saving money.

Reducing soil erosion is a high priority for farmers and has caused increased interest in conservation tillage. But, improved efficiency and reduced costs are their primary reasons for adopting the practice.

What then is conservation tillage? In essence, it is farming on a soil surface that is protected from water or wind erosion by a mulch of all or part of the residue from the previous crop. It is generally done by eliminating the use of the moldboard plow and the unnecessary secondary tillage prior to planting. As new plants come up, the mulch holds the soil where it needs to be.

Kentucky

Kentucky farmers are well aware of soil losses on their rolling and sloped farmlands. They recently became aware of a University of Kentucky Extension demonstration project where wheat, corn, and soybeans were grown for 4 years on 6- to 12-percent sloping hillside with virtually no erosion—and 4-year crop yields of 145 bushels per acre for the corn, and 47 for the soybeans (high yields for the silt loam soil type). Word of the test field results was spread by the CES staff via mass media and field day activities.

With and without practical no-till experience, Kentucky farmers have shown new interest by seeking information about it. In areas of the state where there has been little or no use of no-till, producers have requested educational meetings and more field studies. Extension education meetings in the Owensboro area drew 620 people; in Crittenden County, 155 people; and in the Purchase area some 370.

Indiana

Interest is not just in Kentucky. In Indiana, over a period of 15 months, two extension specialists participated in 134 meetings in 54 counties on conservation tillage. Latest data indicates some type of reduced tillage was used on over 3½ million Indiana acres in 1980; that's up some 2 million acres from 1974. In response to the increased interest, Indiana Extension has released four publications with supporting material and two slide-tape sets.

Iowa

In Iowa, it is estimated that more than 13 million of their 22 million acres of row crops were under some form of conservation tillage in 1980—more than a sixfold increase over the less than 2 million acres in 1970. For that state's farmers this means an estimated annual fuel reduction of at least 13 million gallons of diesel fuel when compared to conventional tillage. Also when compared to conventional tillage with a moldboard plow, there's a farmer's time saving of from 0.5 to 2 hours per acre. In March 1982, a statewide conference on conservation tillage is scheduled.

Pennsylvania

Pennsylvania, where soil erosion occurs on many of the rolling and hilly fields, is one of the leading northeast states in no-till crop production. The no-till corn acreage there in 1981 reduced on farm diesel fuel requirements by about 2 million gallons compared to conventional tillage as practiced in

1970. In one Pennsylvania county (Centre County) less than 5 percent of the 1971 corn acreage was planted without tillage—that figure in 1980 had shot up to over 60 percent. Meetings, media, and demonstration plots are all part of an extensive Cooperative Extension educational effort to ensure that growers have access to current information on successful production practices.

In these four states—and many others—Cooperative Extension is working with agricultural producers to develop a better understanding of conservation tillage. Some are waiting to see if their neighbor's no-till cropping pattern either fails or is successful before they adopt no-till. More than likely, others are waiting for more research in the field—and it is underway with vigor.

Both public and private funds are being used in an effort to understand. Research workers have devoted considerable effort in evaluating the changes that occur in pH, soil phosphorus distribution, nitrogen utilization, herbicide response, pesticide runoff, soil and water runoff, manure management, soil compaction, labor and energy requirements, and those most important crop yields—when various tillage techniques are used.

The Cooperative Extension Service educational program provides growers with a production system that conserves energy, soil, and labor while lowering the cost of production. It will be continued.

And so will this story in another issue.

Alabama REMAPS Electrical Costs

Grady Wakefield
Randolph County Agent Coordinator

Dennis Evans
Community Resource Development
Alabama Cooperative Extension Service

There were many Alabama winters when Robert Clark, 83, could feel the cold wind blow through the cracks in his small, white-framed house on a quiet street in Roanoke.

Clark, who lives alone, always had a problem keeping his house warm, and his efforts did little to prevent his energy bills from rising dramatically. Until recently.

Today, Clark says he's never been more comfortable. His little home in Randolph county is now warm, tight and cozy, because of a unique pilot project in Alabama that appears well on its way to success.

As part of this project, sponsored by the Alabama Department of Energy, the Alabama Power Company, and the Alabama Cooperative Extension Service, Clark's home is weatherized—including installation of storm windows, caulking and weatherstripping. And he is quick to praise the project's work. "My home is now 100 percent warmer. Everyone should have their homes weatherized."

Called REMAP, this special project is much broader in its scope than Robert Clark's home. It involves every member of the Roanoke community and encompasses industrial, residential and commercial sectors.

The project, Randolph Energy Management Action Program (REMAP), is primarily concerned with electric power, although it equally addresses solar energy, natural gas and other energy sources.

Major Goals

The REMAP program is designed to help reduce the peak demand of electricity at the community level, specifically in the residential sector. The electricity saved can then be freed for commercial and industrial use. These savings can represent a substantial amount of energy.

Ralph Sherer, District II agent coordinator with the Alabama Cooperative Extension Service, says Randolph County was selected for the project because of the outstanding leadership and motivation of its citizens. "Recently, the residents of Randolph County were able to attract the largest industry ever to the county, even during a time industrial development in many ereas was at a standstill," Sherer points out. "That industry accounted for one in six new jobs created in Alabama during 1980.

Randolph County was selected also because of its outstanding Extension programs and personnel, and because of the cooperation between city and county government.

"This project," Sherer states, "involves a method which the Extension Service has for years proven is the way to get things done. That is, to get people involved, to aid them in identifying the problem, and then work together in solving the problem."

Development Committee

Project work began in August 1981 when John Spence, Alabama Power Company; Dennis Evans, Alabama Cooperative Extension Service; and Ralph Stanford, Alabama Department of Energy, met with the REMAP committee members to outline an energy conservation program.

Committee members were selected through a survey conducted to determine leadership in the community. Forty leaders were chosen by the 200 survey participants. At least half of the 40-member committee were members of the Randolph County Development Association.

Robert Clark weatherstrips his window.

Joe Turner, first president of the Randolph County Development Association, became chairman of the REMAP committee.

REMAP was divided into nine committees: industry; agriculture and commerce; churches; senior citizens and low-income families; schools and hospitals; government agencies; dealer promotion and energy audits; publicity and promotion; and rules and bylaws.

The Committee established six goals:

- Develop educational programs that promote efficient energy use;
- Promote weatherization and retrofitting of existing buildings;
- Promote the use of energy-efficient methods, equipment and materials in new construction;

- Encourage the use of energy-efficient appliances and properly sized, high-efficiency heating and cooling equipment;
- Organize dealers and energy providers to promote the sale and installation of energy-efficient equipment and materials; and
- Solicit the support of community leaders and organizations.

Programs

Residential energy audits are an integral part of the project, and much effort has been spent promoting them. Under the sponsorship of REMAP, Alabama Power Company personnel conduct free computer analyses and on-site inspections of residences. They give customers information on recommended retrofit practices. Payback periods for installing energy-efficient equipment and materials are also computed.

In November 1981, a weatherization demonstration program was held in Roanoke. In this program, two low-income homes were retrofitted under a specially sponsored Community Action Agency program for low-income homeowners.

The actual work was done by members of the Community Action program. The REMAP committee organized and publicized the demonstration involving members of the Roanoke Senior Citizens Nutrition Program. Transportation was provided first to a house that was in the process of being weatherized with blown insulation, storm windows and caulking. Next, they visited a house where the weatherization process had already been completed.

One subcommittee is actively developing a series of "energy parties" for small gatherings of friends and neighbors. These parties will feature discussions and demonstrations of energy-efficient appliances and materials. The program format and content are adjustable for different income levels and will feature equipment ranging from the complex heat recovery unit to the simple,easy-to-make draft stopper.

The U.S. Department of Energy awarded a $6,000 grant to the city of Roanoke for energy management efforts in the city. Local leaders and REMAP board members are currently determing how to use these funds.

Support Sources

Local ministers are actively involved in the REMAP project from several angles. Because of their positions in the community, they are excellent resources for helping residents become more energy conscious. Sponsors are encouraging ministers to distribute publications and other materials on energy conservation to their congregations. Ministers are also being made aware of resources materials directed toward energy management for religious structures.

The media are actively involved in promoting the REMAP program. Media representatives attend each meeting. Newspaper coverage includes special-interest articles and coverage of special activities. For example, during November and December 1981, attention was given to the subject of heating with wood. Future topics include solar energy and other energy-related subjects.

Evaluation

Evaluation—both formal and informal is a continuing part of REMAP. The project will monitor energy usage closely during the test period and obtain results for individual customers. REMAP is developing a sophisticated system to collect data for measurement and evaluation of results. This system will involve a number of electric substations in the REMAP service area.

The formal evaluation component of REMAP offers an opportunity to appraise the value of motivational and educational programs in terms of economical and potential energy savings.

At the end of 1982, the total REMAP program will be evaluated. The amount of electricity coming into the Roanoke area in 1982 will be compared with the 1981 record. If the number is smaller, this pilot project may be largely responsible. REMAP members have the utmost confidence in the total community involvement concept and believe they can't miss.

It Saves Energy—But You Have to Mow the Roof

It was bound to happen—4-H went underground.

They went under the ground, that is, beneath 350 tons of Michigan earth, concrete and insulating materials to demonstrate ways to save energy.

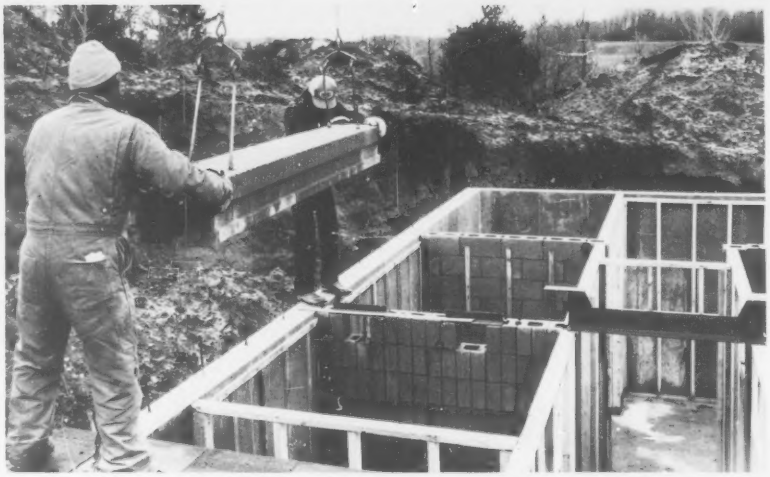
The Michigan 4-H Foundation recently built an "earth-sheltered home" at their Kettunen leadership training facility in the Northern part of the state and they say it saves from 20 to 50 percent in heating and cooling costs.

The structure is spacious, with three bedrooms; one and a half baths; living, family/dining and utility rooms; a two-car garage; a study; a kitchen and a handy mud room/entryway. Though there's no basement or attic, there are ample storage areas, including a large walk-in closet off the master bedroom.

The home is covered on three sides with earth to take advantage of the soil as a buffer against the elements.

"The ground itself is not a good insulator," says Ed Tonak, Kettunen Center manager. "But the earth takes a long time to heat up or cool down. It usually stays around 50 degrees year round, so there's only a small temperature range to deal with. With proper insulation, it takes very little energy to heat or cool the building," he explains.

For example, when it's 85 degrees outside, the ground surrounding the structure is a cool 50 degrees. Opening the windows maintains the temperature in the building at a comfortable 65 to 75 degrees. In the winter, when outdoor temperatures dip into the teens and below zero, Tonak says he's been able to maintain the indoor temperature at a comfortable 65 to 70 degrees with the help of a wood-burning stove and a circulating fan that moves the warm air throughout the building 24 hours a day.



Workers set concrete roof sections into place. More than 350 tons of dirt, concrete, and insulation materials were used to build this energy-saving structure.

Soil covers three sides of the home. The fourth side features large windows, which serve as emergency exits and provide ample natural lighting.

So far this winter, the new structure has required 1½ gallons of fuel oil a day. The contractor estimates that 1 gallon of that goes to run the water heater. Seldom is the oil furnace used as a backup heat source. Monthly electricity bills have averaged around $30, mostly due to the fan, which operates continuously.

The home has a southern exposure and a specially angled roof that allows the sun to shine in during the winter but keeps it out during the summer. Large windows along the exterior side of the building provide ample natural lighting and also serve as emergency exits.

Jayne E. Marsh
Information Coordinator/4-H Youth
Michigan State University Extension

Three-fourths of the new earth-sheltered home is below ground, but living quarters are comfortable, spacious and well-lighted.

Properly installed, a wood stove can supply nearly all of a home's heating needs.

Quieter and Cozier

Besides being energy efficient, the building also requires little maintenance. There's no need for painting or roofing or gutter repairs. As Tonak cheerfully points out, "All I have to do is mow the roof!"

An earth-sheltered home may be maintenance-free and energy wise, but what's it like to live below ground? Tonak says that he and his family have no regrets about their new quarters.

"It's much quieter, cozier and safer than ordinary houses," Tonak says. Because the building is made of nonflammable materials, it's virtually fireproof and indestructible. There's plenty of natural light from the windows, and we have all the comforts of a conventional home, plus a fantastic view of the woods. It's not at all like living in a cave," he explains.

Living in the middle of the center's beautiful natural area, the Tonaks have a dramatic view of the birch-filled woods. Because most of the building is covered with soil, the home can be landscaped to blend with the natural environment and not disturb the wildlife living there.

The cost of the unusual home was $45 per square foot, about $5 per square foot higher than the average above-ground dwelling. But the designer estimates that with today's energy costs, the earth-sheltered residence will recoup its higher construction costs in 4 to 5 years and then begin paying for itself.

"Real Advantages"

The earth-sheltered home took only 5 months to complete, and during its construction, there were plenty of curious visitors.

"Most people were skeptical and intrigued at first, because of the building's innovation design," Tonak says. "But now that it's completed, they've seen that this kind of structure has some real advantages.

To accommodate curiosity seekers, the Tonaks held an open house in early March to unveil the new building. More than 1,000 adults and children have traveled as far as 200 miles to tour the innovative home. Publicity about the open house was mostly by word of mouth.

The designer says that the public's tremendous interest in this kind of alternative housing is due to spiraling energy costs.

"Due to their impressive energy-saving potential, more and more people will consider an earth-sheltered home a real possibility," he says. "I think they'll become a popular trend in the future."

There are 11 similar homes in northern Michigan right now and many others in Wisconsin and Minnesota. Plans are underway to build an entire subdivision of earth-sheltered homes in northern Michigan soon.

Besides being a cost-effective and energy-efficient home for the Kettunen Center manager and his family, the home is an excellent example of the Michigan 4-H-Youth Program's interest in energy conservation and innovative programs. "The new building is a tangible illustration of 4-H's commitment to help cope with the energy crisis," says Don Jost, executive director of the Michigan 4-H Foundation, which owns and operates the state - 4-H leadership training facility.

"Not only is the earth-sheltered home a long-lasting, durable capital investment, but it's a great instructional tool as well," he says. "We plan on producing a slide-tape and perhaps a scale model of the building to explain the structure and its benefits. The building is also an excellent way to teach young people about new solutions to the energy crisis," he adds.

Conservation—Making Energy Affordable and Reliable

In Boston, 88 cents of every dollar spent on energy by homeowners, public institutions, businesses, industries, and others, *leaves* the city's economy. More than $1.2 billion are taken out of the pockets of the city residents each year, and put into the pockets of people in another city, state or nation.

That is one of the findings of the Suffolk County Cooperative Extension Service's Project for Reliable and Affordable Energy (PRAE), and it is a statistic they hope to change.

PRAE is the brainchild of Jay Vogt, the Community Resource Development Specialist for the county. In 1979, he began planning an energy education project for the county to focus on energy education. Working with individuals in the county who shared his energy concerns, Vogt drafted grant proposals and received funding from the National Science Foundation and the federal Department of Energy.

Vogt hired two more staff people, Alice Kaufman, project manager and Beth Dowling, project assistant. Their goal was to establish a project a step beyond basic energy education and show people how to establish energy policies for their communities.

Developing communitywide energy policies is not easy. In fact, for many people, the overall problem has seemed too large to even begin tackling.

"That's the attitude we want to change though," says Alice Kaufman. "We want to let people know they *can* take control," she states. "We see our project as a catalyst providing people with information, ideas, literature and other resources related to community organizing around a specific issue."

Key Issues

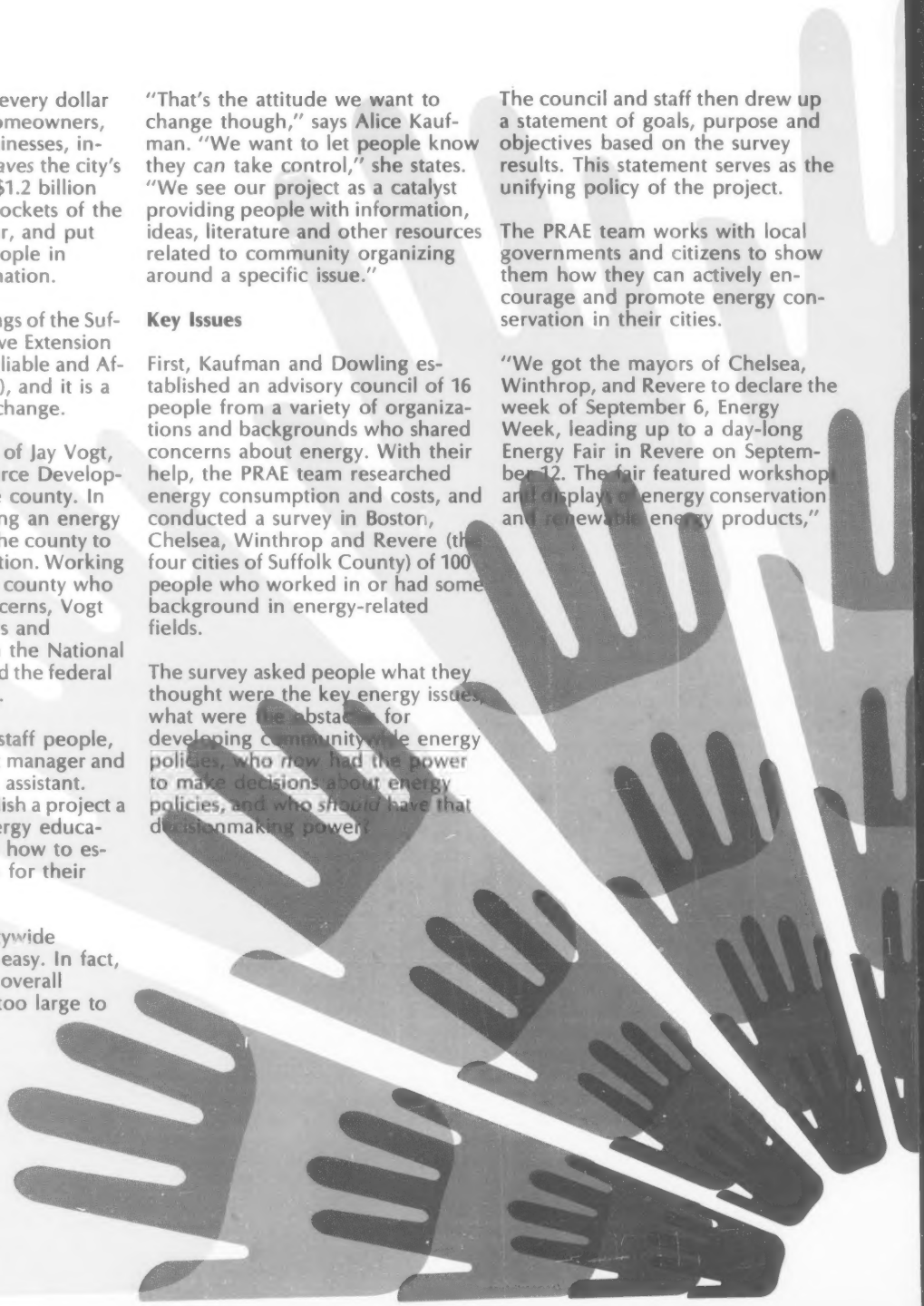
First, Kaufman and Dowling established an advisory council of 16 people from a variety of organizations and backgrounds who shared concerns about energy. With their help, the PRAE team researched energy consumption and costs, and conducted a survey in Boston, Chelsea, Winthrop and Revere (the four cities of Suffolk County) of 100 people who worked in or had some background in energy-related fields.

The survey asked people what they thought were the key energy issues, what were the obstacles for developing communitywide energy policies, who *now* had the power to make decisions about energy policies, and who *should* have that decisionmaking power.

The council and staff then drew up a statement of goals, purpose and objectives based on the survey results. This statement serves as the unifying policy of the project.

The PRAE team works with local governments and citizens to show them how they can actively encourage and promote energy conservation in their cities.

"We got the mayors of Chelsea, Winthrop, and Revere to declare the week of September 6, Energy Week, leading up to a day-long Energy Fair in Revere on September 12. The fair featured workshops and displays on energy conservation and renewable energy products,"



Susan Mitchell
Publications Editor
Extension Service
University of Massachusetts

says Kaufman. "We also gave presentations at Chamber of Commerce and Rotarians club meetings."

In addition, two day-long conferences focusing on the specific energy needs of business and local governments were held in late October and early November. The conferences were organized by volunteers from Suffolk County who worked together as "design teams." They ensured that the conferences featured topics that would be the most useful for the intended audiences.

For the business conference, workshop topics included: Solar Applications in Business Buildings; New Lamps, Ballasts, and Lighting Systems; An Introduction to Alternative Technologies for Business; The Ins and Outs of Heating and Cooling; and Energy Conservation and Alternative Energy Sources: Public/Private Partnerships That Work.

At the local government officials conference, workshop topics included: Financing Energy Conservation in Municipal and Industrial Buildings, Involving the Public in Energy Policy Planning, Removing Barriers To Energy Conservation in the Public Sector, Financing Community Energy Strategies, and Button-Up Northampton—A Model for Community Involvement in Energy Conservation.

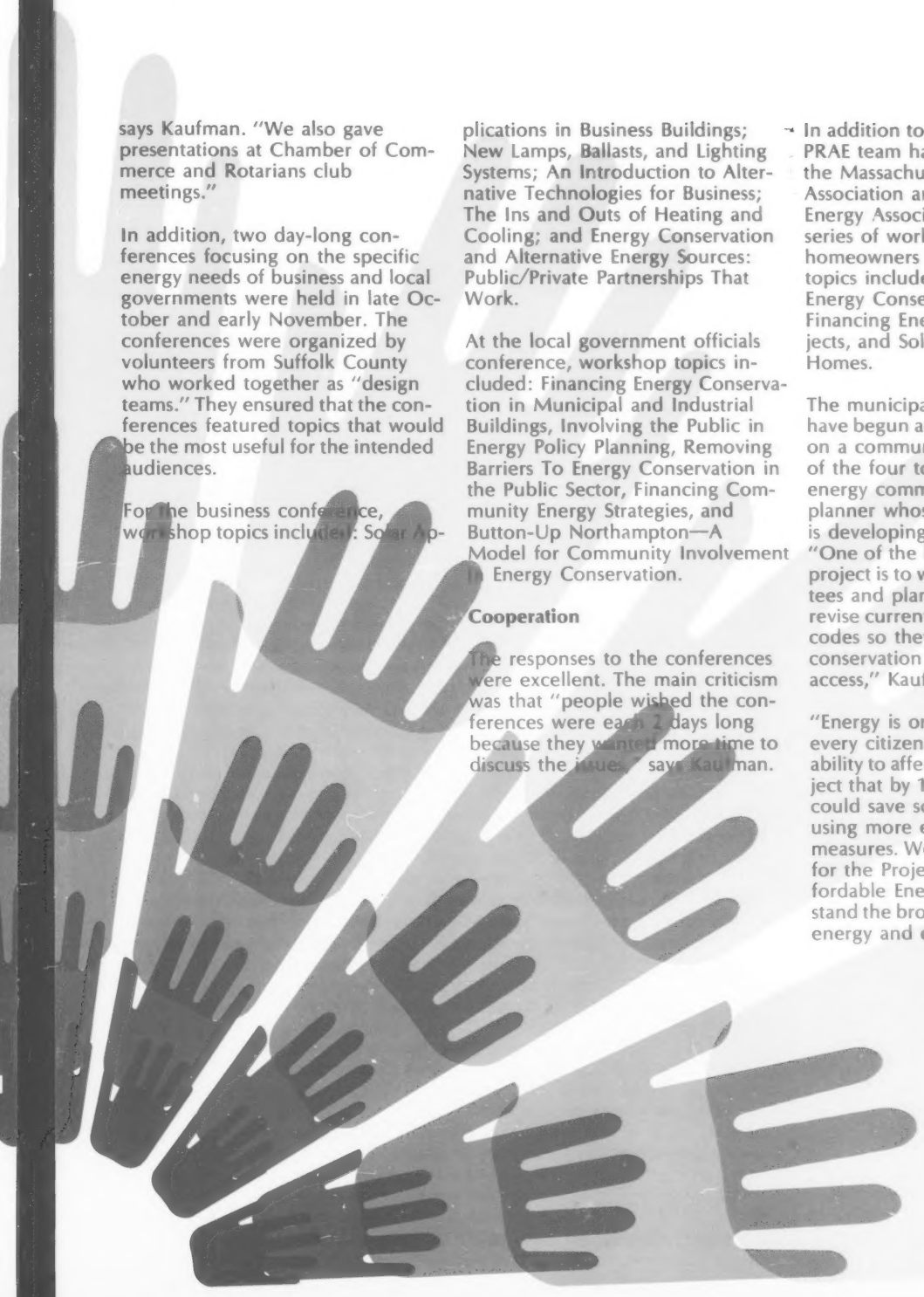
Cooperation

The responses to the conferences were excellent. The main criticism was that "people wished the conferences were each 2 days long because they wanted more time to discuss the issues," says Kaufman.

In addition to the conferences, the PRAE team has been working with the Massachusetts Audubon Association and the Urban Solar Energy Association to design a series of workshops for local homeowners in the four cities. The topics include No-Cost Low-Cost Energy Conservation Techniques, Financing Energy Conservation Projects, and Solar Applications in Homes.

The municipalities in the county have begun addressing energy issues on a communitywide basis. Three of the four towns have developed energy committees or have a staff planner whose major responsibility is developing energy policies. "One of the long-term goals for the project is to work with the committees and planners to investigate or revise current buildings and zoning codes so they encourage energy conservation and allow for solar access," Kaufman states.

"Energy is one of the issues that every citizen has the right and the ability to affect," she says. "We project that by 1990 Boston households could save some $96 million by using more energy conservation measures. We feel support growing for the Project for Reliable and Affordable Energy as people understand the broad economic impacts of energy and energy conservation."



Something New Under the Sun for Farmers

Stu Sutherland
Public Information Officer
Extension Service, USDA

You might say that Old Sol has seen it all. The sun was up there beaming its energy down to the earth long before humankind planted the first seeds for an agricultural crop, or domesticated the first farm animals.

If the sun was capable of taking any special interest in what's going on here these days, Old Sol might be winking inquisitively at the roughly 180 onfarm Extension solar heating demonstrations. The sun probably knows that such activity on these special farms in 14 states is simply following in the tradition of most Extension work—demonstrating on farms the results of research.

Some of the onfarm projects that will show how the sun's energy can be collected to heat livestock structures and to dry crops and grains are not operational yet. However, enough solar units are already providing usable heat so that farmers and others are beginning to take notice. Such interest comes from a public awareness component built into the projects before the first building plan was approved.

The Extension Service, USDA, and the U.S. Department of Energy, the federal cosponsors for the short-term program, wanted information about the practical use of solar heating by onfarm demonstrations to become widely known. Plans for solar heat collectors, both onfarm-constructed and commercial, look good on paper, but farmers want to know and see if they will work under everyday farming conditions and, more importantly if they will pay off for their particular type of operation.

After initial planning, the next step was to locate interested Cooperative Extension Services who were willing to go beyond the costs and time that the federal agencies could provide. The 14 states who answered the call are listed for the two main programs—four states are involved in both programs.

The first program to begin was the onfarm demonstations for solar heating of livestock structures housing swine, poultry, and dairy animals. With the program now in full swing, there are some 82 on-farm operational projects. Two more should be operational in time for the spring heating season.

The projects are located in Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, Ohio, Vermont, and Virginia. The demonstrations are on farms where the solar heat is being used to warm swine (64 farms), dairy (14), poultry (5), calves for veal (1), and one general farming enterprise.

Farmer Cooperation

Extension project engineers in the various states have found additional farmers willing to replace 10 to 17 formerly approved projects that were dropped due to various economic and other problems.

The program for livestock shelter heating—as does the program for drying crops and grains—depends upon a lot of cooperation by participating farmers. These farmers have agreed to a plan for a solar collector that is designed to suit their particular location and farm functions. They have also agreed to build the solar collector and pay for half of its cost.

Up to half of the cost of the demonstration collector was paid with special pass-through funding that was provided by the Department of Energy by cooperative agreements with the participating states.

The farmers also agreed to operate the solar devices for 2 years while they are monitored for problems and efficiency levels by the state Extension project engineers. And the farmers must also have agreed to some publicity activities. However, the solar collector becomes their property after the 2 test years, and the farmers will have no further responsibility to their contract.

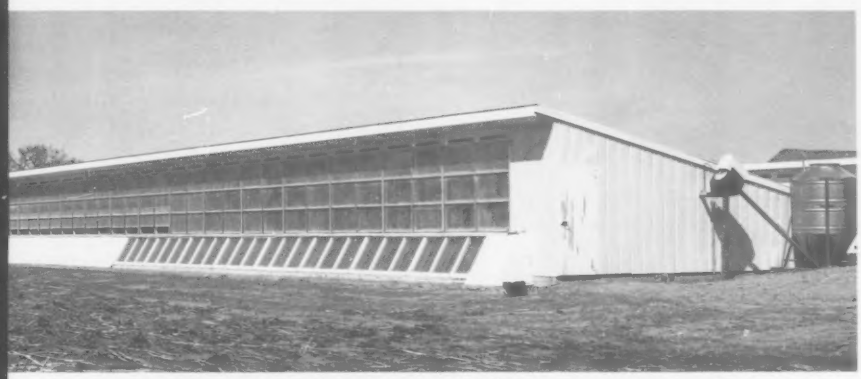
The program process of design approval, construction and testing, completing the test, and a final report (on statewide projects by the project engineers) is basically the same for the program involving solar heat methods to dry crops and grains. Nine states were selected in November 1980 to participate.

For drying crops and grains the states are Florida, Illinois, Kansas, Maryland, Michigan, Missouri, South Carolina, Tennessee, and Virginia. As in the other program, each of these states will establish between 8 to 10 onfarm demonstrations.

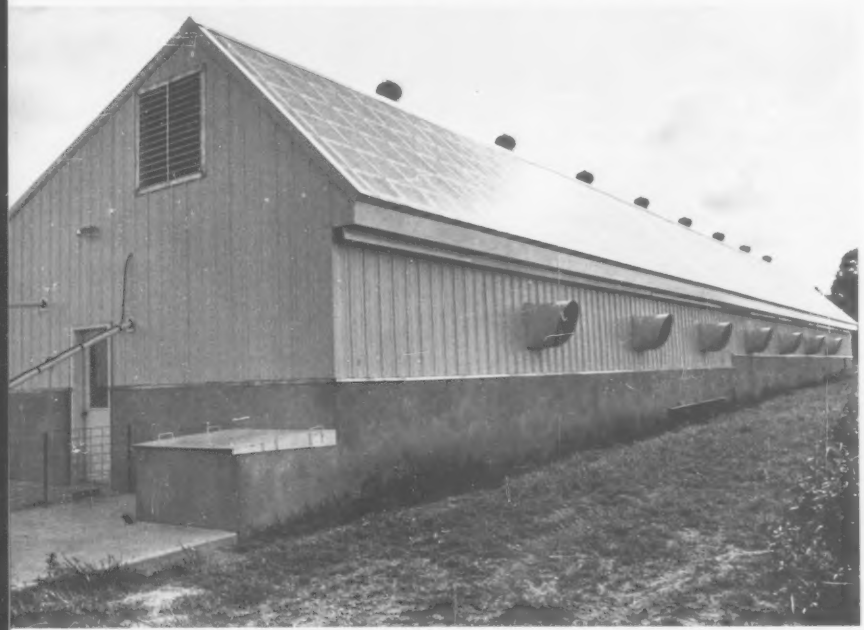
By January 1982, designs had been approved for 68 of these crop/grain projects with all of the solar units scheduled to be operational by fall of 1982.

Because of the present unfavorable farm prices and the high cost of money, it is anticipated that some farmers with initally approved plans will drop out and new cooperators will be sought. With funds already made available to assist in the construction and testing phases of this program, the important onfarm demonstration collectors and their use with various structures and heat

This solar-heated unit in Illinois is used as a swine farrowing house and nursery building. Solar-heated air is also used for drying grain.



A solar swine nursery in Glenvil, Nebraska, holds as many as 550 head and has required no backup heating system since it was first used in October 1979.



A roof-mounted solar water heater preheats wash water for dairy cows on the Gale Snow farm at Wheatland, Missouri.

exchange devices will be in place to prove their worth to participating farmers and others.

Media Exposure

The agricultural engineer with USDA's Extension Service who monitors plans, progress, and activities in both of the solar programs is Kenneth E. Felton, on assignment from the University of Maryland. Felton says that many farmers in the demonstration states, as well as vistors from other states, are picking up ideas from the onfarm demonstrations to use on their own farms—"because they like what they are seeing." Many of the visitors say they have read about the solar applications in full-length features run in several farm magazines, or they have seen program segments about them on television.

How do the farmers feel about the new installations? Felton had an opportunity to visit five of the participating states last fall where he toured several farms in each state. Felton reports that "in all cases where I asked the farmer about the performance of the (solar) system, he was pleased and would not hesitate to become a cooperator again."

Felton pointed out that both of the two major programs were established with five common objectives—though the first objective changes to fit the program. They are designed to:

- Demonstrate the technical and economic feasibility of using solar energy technology for heating of livestock structures, or for drying crops and grains.
- Test solar energy technology under operating farm conditions.

Mike Drewry, of Wakefield, Virginia, adjusts the fan in this unit designed for drying peanuts. Using available solar energy, preheated air enters the fan.

• Incorporate energy conservation techniques.

Minimize solar heating problems.

Identify incentives and opportunities for widespread farm application of solar energy technology.

Much of the monitoring of operating solar energy collectors, and the farm structures they heat, will eventually demonstrate if solar energy is feasible while in daily or seasonal use on the roughly 180 farms. Quarterly reports from the 14 state project engineers indicate that problems being encountered on farms with the units can be solved.

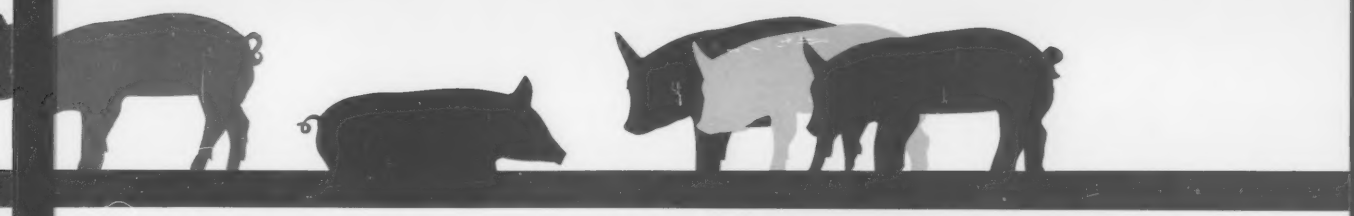
In one case engineers almost needed to redesign a mini-computer that controlled the various operations of one solar system. In another case they needed only to replace a part of the plastic covering for the collector that had been broken by a stone spun against it by a passing piece of farm equipment.

Variety of Materials

A very important part of efficiency level improvement for most of the systems involves the type and amount of insulating materials being used on the structure that is being heated, or the device used to store captured heat until it is needed.

A high percentage of the systems use solar-heated air to warm a certain area, so keeping unwanted (usually cooler) air out of the system means a big difference in efficiency levels. Many systems use solar-heated liquids running through pipes to furnish the heat where it is needed—such as heat to the cement floors of baby pigs' pens—and connecting pipes have to be made safe from freezing so the whole system doesn't break down during critical periods.

While a high percentage of the solar energy collectors are in fixed locations, such as on the roof or as



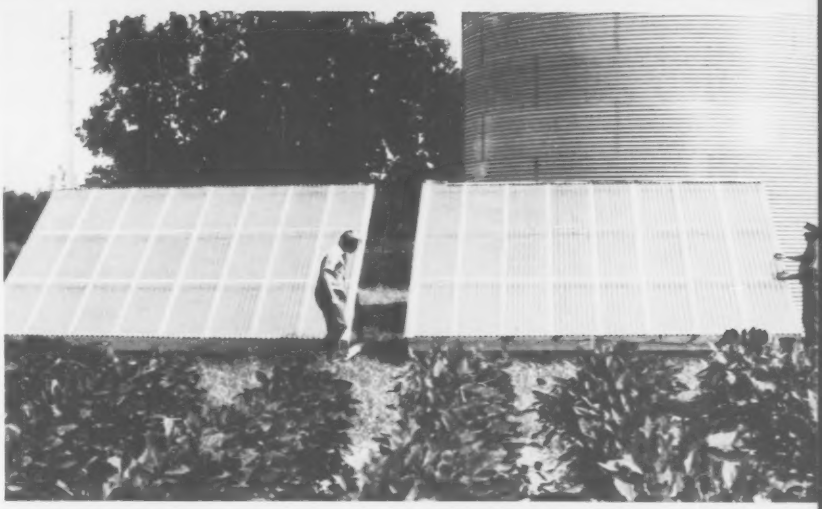
an entire wall of a structure, a few of them are portable. The portable collectors are generally built on "skids" so that farmers can pull them from one use to another with a tractor. One example of this is a Missouri farmer who wanted to use his solar collector to help heat his home when he is not using it to dry corn.

Of course, hot air and hot liquids are not the only way to "store" the collected solar energy. Crushed rock, or even washed gravel from a stream bed, is another good way to store the heat until it is needed during the cool of the night. Another storage material being tried in one of the demonstrations is salt.

Commonly being used as material are solid concrete building blocks. The face of each block that's pointed toward the sun is painted with flat black to absorb heat. The blocks are stacked in the form of a wall, without the use of connecting mortar so there are ¼-inch air spaces between them. Air is then drawn through the solar-heated blocks and into the area to be warmed.

Usually in such a wall configuration there is also a method to warm winter air by passing it through a plastic/fiberglass sandwich in front of the blocks at the same time as they are also being heated by the sun's rays. Thus, there is warm air from the sandwich air flow during the sunny part of the day and warm air at night from the blocks themselves.

In at least one such wall installation, the reverse becomes true when cool air of summer nights is drawn through the blocks to cool them. The cooled air is released into the animal area during hot days and the wall is shaded during daylight hours.



Mike Buschermohle, left, project engineer, and Robert Brabbam, a South Carolina crop producer, inspect a solar grain dryer.

Mixed Reports

It will be many months until all the final data are in and final reports are issued and digested on the two solar demonstration programs.

Media reports on them are mixed. While one farm-oriented magazine cautions that solar energy is probably not cost effective, reports from demonstration project farmers in another magazine include these comments about their solar system: "No changes (needed to the system) we're pretty well running the same"—"Still happy"—"Should have built it sooner"—and "It's working as good as ever."

Other public awareness activities that are underway as a part of the programs include state developed fact sheets and brochures, seminars using slides that show installations, models of the structures, and video tapes or films of the projects produced for television use. Tours of the facilities are also being planned into most project schedules.

In addition to several papers on the solar projects being presented at various meetings of the American Society of Agricultural Engineers, a paper was written and presented—and will appear in the proceedings—at the Third International Conference on Energy Use Management, Oct. 26-30, 1981, in Berlin, (West) Germany. An article has also appeared in a French swine producers magazine. From international contacts such as these, the programs are receiving favorable acceptance overseas.

To reach an Extension project engineer near you for more details, or to plan a visit to one or more of the demonstrations, contact Ken Felton for the project engineer's name, address, or phone number. Call Felton on (202) 447-5369—or write him at USDA Extension Service, Room 5533 South Building, Washington, DC 20250.

Wood Fuels— For Today and Tomorrow

DUE TO A LACK OF PHOT
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Wood is our oldest fuel. As recently as 1900, wood provided 90 percent of our Nation's energy requirements.

The switch from wood to natural gas and oil was triggered by the attraction of these new fuels. They were readily available, relatively cheap, and easy to handle. Today natural gas and oil are neither cheap nor abudant. With almost 80 percent of North Carolina's energy generated from petroleum and coal, many industries are looking for alternative fuels. Wood appears to be one of the state's best.

Wood energy can be used for more than just steam production. Space heating and electricity generation are additional uses. Gasification permits wood to meet a variety of industrial energy needs. Wood gasification is a developing technology with the potential for economic retrofit to existing oil and gas systems.

Use of wood from North Carolina's almost 20 million acres of commercial forests can provide a significant source of renewable energy and important economic benefits for the state.

Advantages and Disadvantages

Using wood as an industrial boiler fuel will provide a way to market otherwise unusable and wasted fiber. These new markets will not only create additional jobs and income for industry, but will also give private landowners the chance to upgrade forest land and at the same time receive income for fiber.

There are some disadvantages when using wood. The initial investment for equipment is high. The fuel itself is bulky. Handling and storage costs are higher and additional operator attention is needed relative to oil and gas. Handling wood is like handling coal.

Availability

The fuel wood resource in North Carolina can be divided into two categories: sawmill residues and forest residues.

Sawmill residues include mainly bark and sawdust. Recent surveys indicate fewer than 400,000 green tons not used each year. As more people realize its value as a fuel, this unused residue is disappearing.

Residues from the forest will be the major continuing source of fuel. They include low-quality standing timber, logging residue left in the woods after timber removals, and rotten and dead trees. From a forest management standpoint, North Carolina needs markets for at least an additional 14 million tons of this material per year. The energy in this amount of wood could replace 47 percent of the oil and gas used to produce energy by industry and commerce in North Carolina.

Wood in growing trees is wet. Wet wood chips cannot be used exclusively in most coal-fired boilers unless the boilers are modified. But a drier, more compact fuel such as wood pellets allows coal boilers to use wood without major equipment changes. Pellets can be produced by grinding, drying and compressing sawmill residues or forest residues.

Extension's Role

The opportunity to upgrade the forest resource through use of wood as an industrial fuel encouraged the

Larry G. Jahn
Extension Forest Resources Specialist
North Carolina Agricultural Extension Service

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Extension Forest Resources Department at North Carolina State University (NC State) and the North Carolina Forestry Association to cosponsor in 1977 four 1-day seminars dealing with wood as an industrial boiler fuel. The seminars were designed for managers and engineers concerned with energy production in industrial, commercial, and institutional facilities using oil, coal, or natural gas for the production of steam or direct heat, and those involved in the harvesting and procurement of wood resources. Extension forestry personnel and nongovernment speakers provided up-to-date information on the availability of wood resources across the state, methods for burning wood, and case studies on the economic feasibility of using wood as a fuel.

Later that year, the Governor formed the Wood Energy Coordinating Group to promote development of wood as a source of industrial and commercial energy. The group included representatives from different departments of state government and the university system, including Extension Forest Resources.

To meet the growing interest in the use of wood fuel, Extension hired a part-time engineer to handle technical questions dealing with wood combustion, equipment, pollution control and economic feasibility. With the addition of this expertise to the group, Extension Forest Resources could provide educational seminars covering all phases of wood energy. During the next 2 years, Extension sponsored numerous workshops, field trips and media tours. To complement these activities, publications, fact sheets, flyers and slide/tapes were developed for distribution throughout the state.

As time went on, it became clear that the most effective means of producing change was site-specific technical assistance promoting the use of wood fuel. This meant full-time combustion expertise and one-on-one case studies. A proposal meeting these needs was next submitted to the Southern Solar Energy Center. Southern Solar accepted the proposal and contracted with NC State to form a Wood Assistance Team (WAT) and provide this site-specific technical assistance. WAT was composed of representatives from three North Carolina organizations—the Industrial Extension Service, the Agricultural Extension Service (Extension Forest Resources), and The NC Department of Natural Resources and Community Development. WAT developed a methodology which identified nonforest product facilities that had a high potential of coverting to wood fuel. From a list of 7,000 firms, WAT selected four firms for in-depth case studies and made presentations to these companies on the merits of using wood as a fuel.

Recent Developments

The four firms in the WAT case studies are now deciding which type of fuel they will use. If the four companies switch to wood, it is estimated that fuel saved as an oil equivalent would total 11 million gallons or $5 million.

The combined efforts of Extension Forestry, the state of North Carolina and the Wood Energy Coordinating Group are now beginning to show dividends. Twenty-five nonwood industries currently burn wood or will do so in the near future. These industries include brick plants, textile mills, state institutions and other miscellaneous firms. Estimated annual consumption for these installations is expected to be 550,000 wet tons. This is equivalent to over 29,300,000 gallons of oil.

As an additional incentive to convert to wood, both the state and federal governments offer tax credits to industries which convert. The federal government allows a 10-percent energy tax credit in addition to the 10-percent investment tax credit for any system replacing oil or gas. The North Carolina state legislature has authorized a 15-percent tax credit for the installation of any new wood-fueled energy system.

Conclusion

With the abundance of wood in North Carolina and increasing prices for traditional fuel sources, wood energy can be expected to be increasingly important in the state's energy systems. Ten percent of North Carolina's annual total energy needs could be economically supplied by wood without depleting our reservoir of standing trees. The NC Agricultural Extension Service will continue to help in reaching this goal by assisting both wood and nonwood industries throughout the state.

Extension Offices for All Seasons

James K. Wolfe
Writer-Editor
Extension Service, USDA

In this period of soaring energy costs, county Extension agents, working with local planners, are proving that energy conservation starts in their own backyard.

At the Extension offices in Hamilton, Ohio, and Klamath Falls, Oregon, careful selection of energy components and ingenious use of local geothermal resources have resulted in offices that meet the seasonal demands for heat and cooling with low-cost energy-efficient methods.

The newly built Butler County Agricultural Building, on the outskirts of Hamilton, is Ohio's first public building designed specifically for energy conservation. It houses the Butler County Cooperative Extension Service as well as county conservation district offices and two USDA agency offices. Built into the slope of a hill with 75 percent of its area underground, the building takes advantage of the earth's natural insulation capabilities and features a heat-absorbing Trombe-wall that will provide an estimated 40 percent of the annual heating requirements.

The agricultural building, funded by county commissioners, was planned so that it would provide a comfortable working environment by using low-cost energy sources. It would save enough fuel over a 10-year period to justify the added expense of the various energy components.

Planners designed computer models of the Trombe-wall and ran year-long simulations to ensure that its thermal performance would be satisfactory.

The Klamath County office of the Oregon State University Extension Service.

The Trombe-wall is made of a 12-inch slab of concrete enclosed behind 712 square feet of insulating glass. When enough solar energy has been absorbed by the wall and the building requires heat, hot air is blown from the wall into the office areas. In addition, the wall's absorbed heat is naturally emitted into the office space both day and night.

Backup System

Heat loss that would occur at night or on cloudy days is prevented by an electronic eye that triggers a mechanism which automatically lowers a shielding energy quilt between wall and glass. A gas-fired boiler serves as a backup system for the solar heating.

Ventilation for the building is drawn through corrugated steel pipe buried in the ground. These "earth tubes" provide cool air to the interior living space. The underground setting of the building provides additional summer cooling. During the heating season, air drawn through the tubes will be warmed by the earth, which also reduces the energy requirements of the building.

Exterior walls are insulated with a combination of 4 inches of polystyrene and 6 inches of fiberglass. The roof is insulated with about 30 inches of blown fiberglass. Extensive caulking and weatherstripping are used throughout the building.

"Because the building is so well insulated," says Peggy Simmons, Butler County Extension home economics agent and county chairperson, "we do not lose that much heat or coolness overnight or even during the week."

Other energy-saving features include a vestibule installed at the main entrance to reduce the passage of outside air and "berm finwalls" that prevent direct winds from getting through the side doors.

Windows, each with its own window "quilt," are of double-pane insulating glass equipped with movable blinds for additional insulation at night.

The Butler County Agricultural Building houses the County Extension office in Hamilton, Ohio.

The building's heating-cooling system operates 11 hours each day. This system shuts off an hour after the office closes and restarts an hour before the office opens the next morning. A 7-day clock automatically shuts off the system on weekends.

Modern Conveniences

Inside the building partitions allow for flexible planning of work areas.

The 10,808-square-foot building has a combination meeting room and kitchen that seats 80 to 100 people. The kitchen has many modern conveniences—microwave oven, dishwasher, garbage disposal, and track lighting in the demonstration area.

Simons says that the utilitarian apperance of the kitchen ceiling captures the essence of the entire building. The ceiling is unfinished and its pipes are painted an austere white that contrasts with the red fixtures of the fluorescent lights. "The poured concrete building has a practical, modern look that was achieved without being extravagant," Simmons says.

According to architect Dave Maxfield, the cost of the building—including site work, paving, and parking lot lighting—totaled $48.60 per square foot.

Not a Cave

At first, Simmons was skeptical about moving into a building that was 75 percent underground. "The plans gave me the idea we would feel claustrophobic. . buried," she says. "I could just see us burrowing our way into the office every morning. But when it was built, the windows changed my mind. They provide a nice view of the surrounding landscape—and you don't get the feeling you're peering out at earth level."

Useful Information

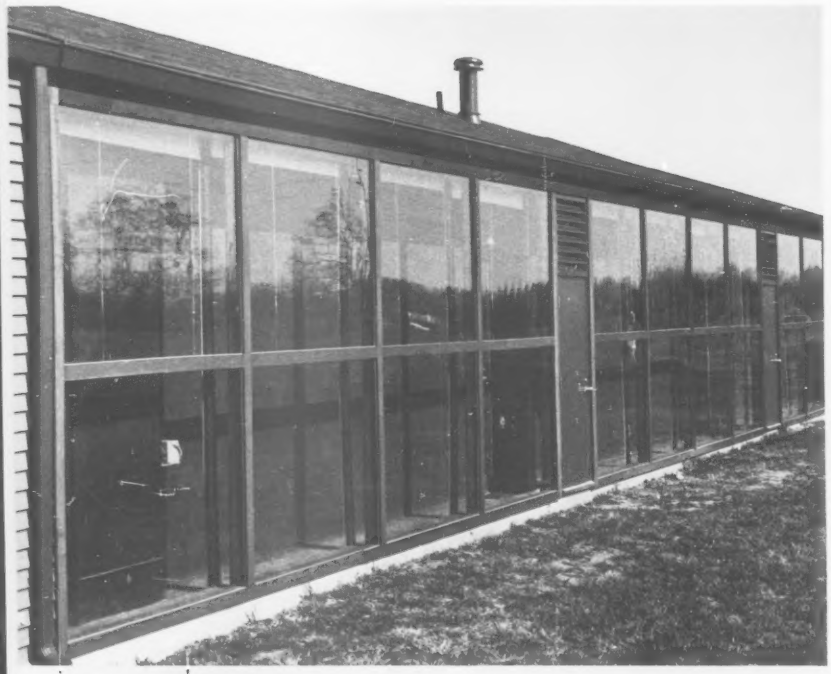
"I see any number of ways that both individuals and business people could benefit from examining our building," Simmons points out. "The windows are a perfect example of a well-designed energy component that could be used in any new home or office construction. The blinds are situated between double glass panes that are energy efficient and seldom have to be cleaned. Also, the energy quilts on the windows are so attractive they could easily replace draperies."

"We are building a data base on energy use of the building," Simmons says, "and hope to compile useful information we can disseminate within a year."

Underground Water Use

The Extension building in Klamath Falls, Oregon, uses geothermal resources in the surrounding earth for both heating and cooling. Local residents have, for over 80 years, known about and used the geothermal water beneath their feet, principally as hot water for space heating. Klamath Falls, located in south-central Oregon near the California border, has 400 hot water wells that heat approximately 500 structures.

Two views of the Ohio Extension office show the interior construction and an exterior closeup of the Trombe wall.



The Extension building is a modern 2-story structure with 5,000 square feet of floor space on the main floor and 4,000 square feet on the daylight basement floor. The main floor contains 9 offices, a reference library, and a sizable conference room. Extension agents designed the building in 1976.

Unlike the Butler County Agricultural Building which nestles into a hillside, the Klamath Falls building is perched on a windy hill 200 feet above the city. All offices have large double-glazed window areas to capture the panoramic view of the city to the south and east.

The design of the Extension building, coupled with its use of a geothermal resource, has permitted an annual savings of $800 in heating bills. County agents estimate the energy savings in cooling to be as high, but these costs have not yet been fully determined.

Highly Efficient

The building is well insulated. The R-30 insulation in the ceiling is equivalent to 9 inches of mineral wool; the R-11 insulation in the walls is equivalent to 3 inches.

The geothermal well being used is 1,150 feet deep and has a 130° F average water temperature. It flows at an estimated 300 gallons per minute. The Extension building uses about 65 gallons per minute of hot water at peak heating periods.

Eight heat pump units are used to circulate heated air through ducts to various portions of the building. In the heating cycle, only the coils of the heat pump units are used; in the cooling cycle, the heat pump is used as an air conditioner.

During the heating cycle, after hot water from the 130° F well runs through heating coils, it discharges into a nearby 88° F well. The return water from the heating coils is also used to melt ice and snow on the adjacent sidewalks.

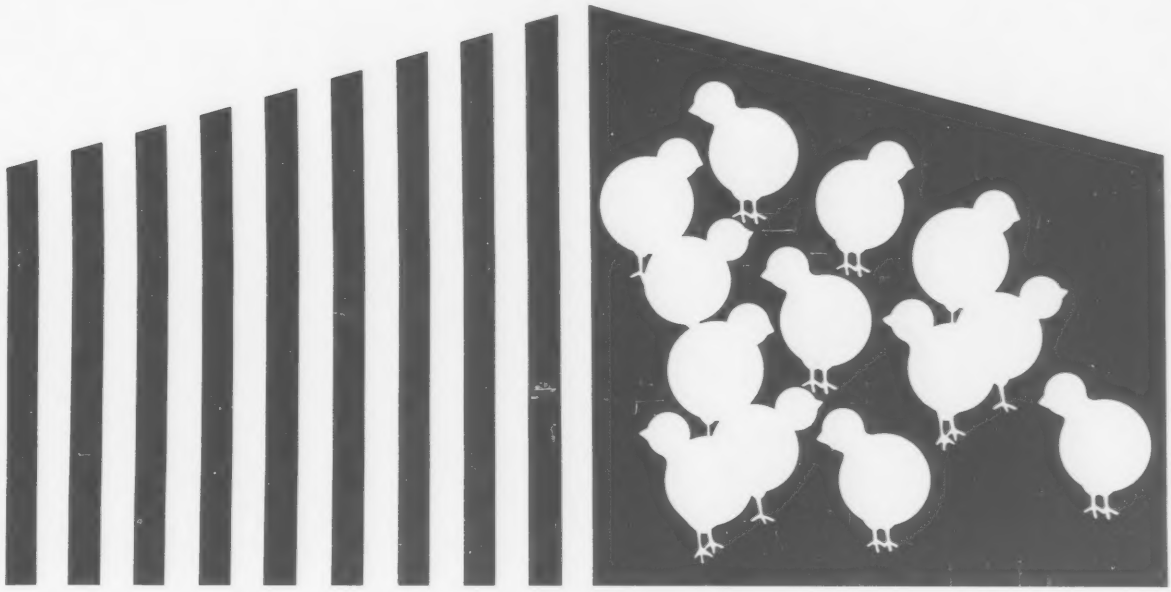
During the summer, well water from the 88° F well is used with heat pumps on the cooling phase and the cooling water is discharged into the 130° F well. The discharge water from the heat pump is also used to irrigate the lawns at the nearby county buildings.

Klamath county agents believe that as energy costs rise, the potential savings from these energy measures will also increase proportionately.

(Developed from information supplied by Bob Furbee, Assistant Extension Editor, Ohio State University; Walter E. Matson, Extension Agricultural Engineer, Oregon State University; and Billie LeSueur, County Home Economics Extension Agent, Klamath Falls, Oregon.)

Half-House Brooding For Chicks

James Booth
Writer
Mississippi Cooperative Extension Service



Saving energy for Mississippi chicken producers is as simple as cutting a house in half.

By using only half the brooding house, it makes sense that only half the expense is involved. With more than 1,700 chick producers in the state operating at least three houses, each filled with 60,000 baby chicks, savings from fuel bills can add up to big dollars.

Poultry producers call the alternative system partial or half-house brooding and it works simply by partitioning chicken houses in halves. Robert L. Haynes, poultry science leader for the Mississippi Cooperative Extension Service, says producers who have changed to the half-house brooding system are cutting their heating expenses in half.

Early Stages

"We use only half the house, because most of the heat for chicks is provided in the early stage of growth. We try to provide most of that heat for about the first 2 or 3 weeks," Haynes says. "If producers can confine the birds in about half the space, they can cut heating costs."

Haynes says it costs Mississippi producers about $300 in fuel costs per batch of 20,000 birds when they heat entire houses. That means some heat is provided from the time the chicks are 1 day old up to 8 weeks.

"With the half-house brooding method, a producer can provide the needed heat for $150 per batch of chicks. It is as simple as that," says Haynes.

"Typical Mississippi broiler farmers will raise five batches of chicks per year, and each farmer may have as many as three houses that will hold 60,000 chicks," Haynes says. "Some farmers even have as many as six or seven houses." For five batches the saving could amount to about $900.

Statewide Savings

"This could mean a very significant savings statewide if everyone used this partial house brooding system compared to conventional house brooding," he says.

Broiler houses are already insulated against the weather with a plastic sheet on the sides of the building. Using some of the same plastic, poultry producers cut a piece to fit across the inside of the house. It is set in place and a few boards are run across the floor to keep the young chicks from running under the plastic to the other side. All that is needed then is the heat.

Producers in Mississippi like the system. Carthage producer Raymond Wilbanks said he thinks this approach to broiler production will spread all over the country.

"It's practical even for small houses," Wilbanks says. "There is little labor or expense. All a grower has to do is adjust his feeder lids and watering system and put up the dividers."

Is Solar Heating Right for You?

Roger A. Peterson
Extension Specialist, Residential Energy
University of Minnesota

Cold winters and rapidly rising fuel costs in Minnesota have spurred tremendous public interest in alternative methods of heating in that state. Enthusiasm for solar heating is particularly high, but solar may not provide economy for all families.

In some instances, investing substantial sums in solar may not be economical when compared to other home improvements that could be made for the same cost. Even where the home site is suitable and the house is ready for solar, homeowners must be careful to obtain the most cost-effective solar equipment. Typical investments in solar equipment run from $1,000 to $10,000, so advance study and planning is important.

The University of Minnesota Agricultural Extension Service is building a research base in residential solar heating including both home and domestic hot water heating. These research findings are made public each year at workshops. Homeowners who made use of earlier research provide useful information back to the university on the practicality of various recommendations. Builders, real estate agents, building inspectors, code officials, bank officers, solar installers, and other professionals involved with solar frequently attend these Extension meetings.

Best Balance

Solar research is part of a broad body of research on economical heating. "Weatherize before you solarize" is a reminder given often to audiences. The researchers seek to find the balance between insulating the home versus capturing solar heat. The best amount of insulation is determined when calculations show the marginal return on investment from greater amounts of insulation is less than what solar would give. Extension teaching is careful not to generalize on what is best for everyone since contractors vary a great deal in bids on home improvement work. In new construction, the cost of an energy-conserving building technique is also difficult to generalize, since contractors vary in attitude toward new ideas.

The price of alternate fuels, including wood, is a key item in deciding if solar is right. In many rural parts of Minnesota, wood is available for the cost of time, a chainsaw, and a truck. But a small- to intermediate-sized solar system may be appropriate to conserve the supply of wood. Various off-peak, dual-fuel, and load management price rates are available for users of electric heating. The overall economy of solar must be analyzed, then, in terms of its actual effect on the monthly bills. Natural gas is available and still priced low to town dwellers, but rapid increases are expected soon.

The greatest uncertainty in using solar is that energy output of solar equipment and passive solar is not well documented for Minnesota. Various estimating methods and only a few cases of collected data are being used to predict output. The greatest need for expanding research is to document more solar houses in Minnesota.

Finally, the cost of solar installation in the marketplace may be the key to determining if solar is right. At present, contractors have difficulty obtaining parts and materials, and workers are learning the proper techniques of installation. Do-it-yourself solar appears very promising for homeowners who plan ahead, shop the solar equipment catalogues, and learn or use skills in carpentry, masonry, plumbing, and electrical wiring.

Increased Efficiency

Two major research projects are underway, one aimed at retrofit and the other aimed at installation in new homes. The retrofit project began in 1979, with solar panels added onto the roof of a self-standing garage in an urban neighborhood in Minneapolis. The hot air from the panels is fan-forced through an underground air duct to the house. In the 40-foot distance to the house, heat can be stored in an underground chamber filled with golf-ball-sized rocks. Meter readings on the electrically heated home show that solar is providing about 35 percent of the heating. When the home is further weatherized in a later stage of research, it is expected that solar will provide 65 percent of the heating needed.

The new home project began in August 1981. High levels of insulation are built into all parts of the house, including 2 inches of styrofoam under the basement floor, 2 to 6 inches of styrofoam on the basement walls, 8-inch wood frame walls, and 24 inches of cellulose over the entire ceiling. Windows are triple pane on north, east and west, and are double pane on the south. All windows have insulating covers for night use. Since the house has a "walkout" basement and faces south, both levels will receive "solar gain" on sunny winter days. A moderate amount of south window, 190 square feet, will test the concept of balancing passive solar with "super-insulation." The 2,500-square-foot home is expected to heat for less than $100 of electricity per year.

As greater numbers of homeowners in Minnesota become interested in substantial energy improvements to their homes, the research of Extension staff and the trial methods by "pioneering" homeowners will help the state economy as well as many individual families.

Heating Water With Wood and Sun

Joyce Patterson
Extension Communication Specialist
Oregon State University

David McCowen, an Extension agent in Oregon, has not paid a heating bill for 3 years. Dave Burtner has paid almost nothing to heat water in his home for 2 years. No one seems to mind. Nice place to live, Oregon.

The way McCowen and Burtner avoid those annoying letters from the power company is by using solar energy in the summer and woodstoves in the winter.

They are among a half-dozen energy Extension agents who, for the past 2 years, have been teaching Oregonians how to conserve energy and save money by heating water with sun and wood, two power resources in ample supply in the Pacific Northwest.

Oregonians are listening to their message.

One of their workshops drew a crowd of 325 participants. Not bad for a night when the second game of the World Series was being played and deer-hunting season had just opened. Most participants have interests centering on the outdoors. As Burtner puts it, "Interest in solar energy in Oregon is simply exploding."

One person who got the message is Darrell Cason, manager of a beauty school in a Portland suburb. Cason attended a solar hot water workshop put on by Burtner in Clackamas County and Burtner's counterpart in Washington County, W. S. "Gus" Baker. The agents wanted to give do-it-yourselfers confidence as well as step-by-step instructions to follow in building and installing low-cost solar water heaters. Burtner says that panels built to their specifications cost about $5 per square foot compared to $15 to $25 per square foot for commercial panels. Each panel is 18 square feet.

Rich Topilec built this small-scale solar collector panel to display at energy fairs.

Solar Energy Pays

Building solar panels wasn't an everyday task for Cason, but he followed their instructions and was delighted when the thermometer on his water storage tank registered 170° F at the end of a sunny fall day.

He promptly built four more solar panels to heat water for his hot tub. Next, he built a solar system to heat water for the beauty school. Cason found that solar energy pays. He qualified for a 25 percent state solar tax credit and a 40 percent federal tax credit. He also got a $300 rebate from Portland General Electric.

Cason is one of more than 2,400 people around the state who have participated in similar workshops supported by the Energy Extension Service (EES) through the Oregon State University Extension Service.

The question was asked if Cason's was an isolated success story or one typical of workshop participants. To find out, the OSU Survey Research Center and a private polling firm were asked to evaluate solar water heating workshops in the Portland area. Telephone interviews with a 10-percent sample randomly selected from the first 1,000 participants revealed the following: About 15 percent of those interviewed had installed solar water heating systems; 75 percent said they expected to do so within a year.

Extension Energy Program Leader Owen D. Osborne was pleased with the findings. He says, "If you assume that 15 percent of all workshop participants have installed solar systems; that 85 percent of the systems they supplement are electric; that each electric water heater uses 4,800 kWh/year; and that the solar system replaces 40 percent of this electricity; then participants in our solar water heating workshops are already contributing more than 500,000 kWh/year in electrical energy savings."

Darrell Cason checks a fitting on the solar panels he built and installed on his home. He got his know-how at a solar water heating workshop conducted by Oregon State University energy Extension agents.

Using a working scale model of a completed solar water heating system, Dave Burtner, left, explains how the system operates.

Energy Fairs

Workshop participants often say that building and installing a solar hot water system is easier than they had expected. Before conducting their first such workshop, Burtner and Baker designed and built a working scale model of a completed system. It cost about $700 to build and attracts much interest every time they set it up. Lane County energy Extension agent Dale Armitage borrowed the demonstration model for a workshop in his part of the state.

In Jackson County, energy Extension agent Rich Topielec worked with volunteers who had taken his workshops to build a small-scale solar collector panel to exhibit at energy fairs.

The solar water heating workshops aren't just for people who plan to build their own systems. The agents also provide information on steps to take and questions to ask before buying a solar system. McCowen, for example, suggests about a dozen questions to ask when selecting a solar dealer. "Find out first what experience they've had with solar hot water systems," he advises. "Then talk to some of their customers."

Burtner and Baker coauthored an Extension circular explaining effective use of solar water heating systems in Oregon. In it, they advise making sure the installer puts the system in operation and demonstrates with a tank thermometer that solar-heated water is being delivered to the solar storage tank.

Data have been hard to come by on how much of an average household's hot water needs can be provided by a solar water heater. Dealers generally say from 60 to 75 percent. Extension agents are more conservative. They tell people "about half." A recent 6-month statewide study by Portland General Electric indicates annual performance may be even less than that.

Safety

People who heat or cook with woodstoves can use wood to heat some of their water. They just need to attach some plumbing pipes and fittings, a safety relief valve, and maybe a pump.

McCowen is the agent who has been most active in teaching people about this method of heating water. He has held three such workshops, and the public is asking for more.

Woodstove water heating installations are more difficult in some parts of the state than in Deschutes County, where McCowen is based, because building code interpretations vary.

A woodstove's high temperatures make safety a problem. But interest remains high. About one in 10 Oregon households use some form of wood as their primary heat source. Nearly a third use wood as a secondary source.

Burtner says solar workshop participants always ask about heating water with wood. One participant mentioned that he had installed a wood burning stove with plumbing to heat his home and hot water. He said that initial cost was not expensive. A water reservoir adds about $100 to the price of a stove. Since he buys the wood to heat his home, he figured he might as well use it to heat his water too.

That's the same reasoning McCowen and Burtner used when they decided to go the solar-woodstove route in their own homes. And it's becoming the way of thinking for more and more Oregonians.

Catalyst for Change

Philip Leslie
Associate Editor
The Exclaimer
University of Missouri Extension

People in the "Show Me" state are learning innovative ways to save energy at home through a program sponsored by the University of Missouri (UM) Extension and the state Department of Natural Resources Division of Energy.

Last spring, in the three-county Boonslick area, field specialists from three program categories presented an eight-session energy short course to homemakers, youth, construction people and commuters. Topics in the "Family Energy Project" included community energy planning, active and passive solar applications as well as basic energy conservation techniques. Some sessions attracted as many as 45 people.

Wanda Eubank, coordinator of the project based at UM-Columbia, says the sessions are a catalyst for change that allows UN Extension area specialists to develop energy programs for their clientele.

The four specialists involved in the project—Don Pfost, agricultural engineering; Dorothy Borchelt, food and nutrition; Martha Bowen, home economics; and Mark Peterson, community development—wrote a proposal for the project and received a portion of the grant money provided through the Family Energy Project.

Many of the people attending the sessions were interested in building their own homes or remodeling their present homes by adding such things as a greenhouse.

"We found many of the participants came to the classes to find answers to specific questions or to get more technical information about practices they were already aware of but didn't know much about," says Peterson.

Though the short course ended after 8 weeks, organized energy conservation efforts in the Boonslick area have just begun. Soon after the program concluded, 20 area residents organized a Boonslick chapter of the Missouri Solar Energy Associates, a nonprofit, statewide organization of people interested in solar energy applications.

Display Units

Four UM Extension specialists from around the state are developing a set of six portable display units on the subject of window treatments. The displays will be available for use throughout Missouri.

One display unit was used at several meetings in the five-county Kansas City metropolitan area, including the Kansas City Energy Expo last March and the Mid-America Cooling Conference in May.

The four housing and interior design specialists developing the displays and instructional materials on window treatments are Marsha Alexander, K. C. Metro; Marian Still, East-West Gateway; Cathy Oesterling, Green Hills; and Paula Hauber, Northwest Missouri.

Each had separate ideas for producing educational materials concerning window treatments. Through the Family Energy Project, they explored the possibility of pooling their efforts.

"We felt that window treatments have been overlooked in the effort to conserve energy," says Hauber. So the four submitted a proposal to the project leaders and received a grant for the materials required to produce displays and supporting information.

Slide programs and packets of "how-to" information are used with the displays. They also feature a computer terminal with access to programs which help answer questions on installation costs as compared with long-term energy and money savings.

"We're trying to present ideas on interior window treatments, such as insulated shutters, roller shades and insulated panels for people to consider," Hauber says. "It's up to them to decide how they use these ideas."

Organizing an energy tour for 200 people was the goal of three Extension specialists: Bev Wiles, housing and interior design; Robert VanHoozer, agricultural engineering; and Charles St. Clair, community development. The tour was designed to emphasize retrofitting existing structures with energy-conserving applications, though examples of energy-saving home construction were included on the tour also. Retrofitting applications included solar water heating, wood furnaces, and an underground heat

loop used with a heat pump. Construction designs seen on the tour included earth contact,in which one or more sides of the structure is underground; geodesic dome, a lightweight above-ground structure; and terra dome; in which the entire structure is underground. Agricultural applications were examined, such as a modified solar grain dryer.

Energy Encounters

The day's activities began with a slide program to show participants what to expect on the tour. They spent the rest of the day touring the selected sites to see what has been done in the area, by people like themselves, to conserve energy.

"Hopefully some of these people were encouraged to develop some kind of energy conserving practices in their own homes once they saw what their neighbors were doing," Wiles says.

Taking a different approach with the energy conservation theme, Mary Dwyer, Bootheel area housing and interior design specialist, presented a program to 80 Girl Scouts in March. Called "Energy Encounters of the Fun Kind," the program provided a look at basic energy conservation principles.

"Energy Encounters," conducted at a community center, gave participants the chance to observe such things as cooking with solar energy, how a photovoltaic cell produces electricity from the chemical reaction stimulated by light, and a solar collector. The program also involved a review of steps that could be taken at home to save energy.

A big part of the project involved the girls themselves. "To help ensure that the girls understood the concepts we wanted to get across," says Dwyer, "we asked the juniors (ages 10 to 12), who went through the program in the morning, to help teach the Brownies (ages 8 and 9), who went through the afternoon sessions.

"Helping to teach the ideas they had learned previously helped the girls to better understand what we were trying to teach," she says.

Viginia Vinyard, East-West Gateway area community development specialist, is working on a program to help inform St. Louis area citizens about a transportation alternative to motorized vehicles—the bicycle. "We're developing educational materials directed to the general public to show how autos and bicycles can be compatible," says Vinyard.

She was involved in a recent community project in St. Louis in which 400 participants toured 12 neighborhoods to view the progress on community projects in each of the neighborhoods.

A survey is another part of the campaign to promote bicycle transportation. "We plan to distribute the survey to 4,500 individuals—employers, local government officials, motorists and bicyclists to determine their attitudes concerning the bicycle as a means of transportation," Vinyard says.

"Good Business"

In the Mark Twain area, home and commercial construction firms as well as building material suppliers and bankers were the target audience of a seminar last December entitled "Energy Efficiency is Good Business."

Organized by three area specialists—Bob Miller, community development; Juanita Brown, family economics and management; and Jean Gatzmeyer, agricultural engineering—the program covered such topics as insulation and heat loss, passive and active solar energy applications, and conducting energy audits on structures in the planning stage.

"It was amazing the position response we got from local construction firms," says Gatzmeyer. "They were very enthusiastic."

"Our efforts were well received," says Brown, "and I feel that because of the success of this seminar these people have more confidence in Extension as a credible source of energy conservation information." Similar programs are being planned for next year, she says.

Last September, 50 high school students and 20 adult leaders from the Green Hills area attended a 4-day conference designed to help youth learn to manage their energy environment.

Jerald Morrison, 4-H youth specialist in the Green Hills area who helped organize the conference, says the project involved several organizations including three area rural electric cooperatives, the Missouri State Highway Patrol and some local VISTA Volunteers. During the event young people learned how to conduct a home energy audit and how to reduce energy losses in the home. Participants also examined community efforts at energy conservation.

"They saw how a community can deal with energy use and the decisions that can be made on a community basis to save money on energy," Morrison says.

Doctor Diagnoses "Home" Remedies

James Nugent
Instructional Resources Generalist
Cooperative Extension Service
University of Illinois at Urbana-Champaign

Joan Todd
Extension Adviser
Winnebago County Cooperative Extension
Rockford, Illinois

Doctor Bowman leaned back in his swivel chair, cleared his throat, and in a gentle but firm tone, prescribed the treatment that would be necessary if his patient were to survive the winter without severe financial hardship.

"I've examined you thoroughly," he said, "and I'm afraid you have a serious condition. You are suffering from 'Heat Deprivation.' But there are immediate remedies. We must thicken the insulation in your attic, install a new duct switch on your clothes dryer, and immediately replace your clogged furnace filter!"

In actuality, Michael Bowman, a construction trades teacher at the Area Vocational-Technical School in Rockford, Illinois, served a year as Extension's "Energy Doctor." As part of his duties, Bowman made "house calls" throughout Winnebago County, conducted walk-through home energy audits, and prescribed energy-saving methods that helped homeowners make their houses energy efficient.

Michael Bowman explains to Joan Todd the necessity of keeping furnace filters clean.

This public education program on energy was developed in late 1979 by the Winnebago County Extension Energy Advisory Committee with funds granted by the Illinois Institute of Natural Resources.

The committee needed an idea that would quickly evoke public interest in energy conservation. The project was funded for only 1 year.

"The message the committee wanted to get across was clear," says Joan Todd, committee member and adviser in home economics for Winnebago County Cooperative Extension. "The problem was . . . how to go about it."

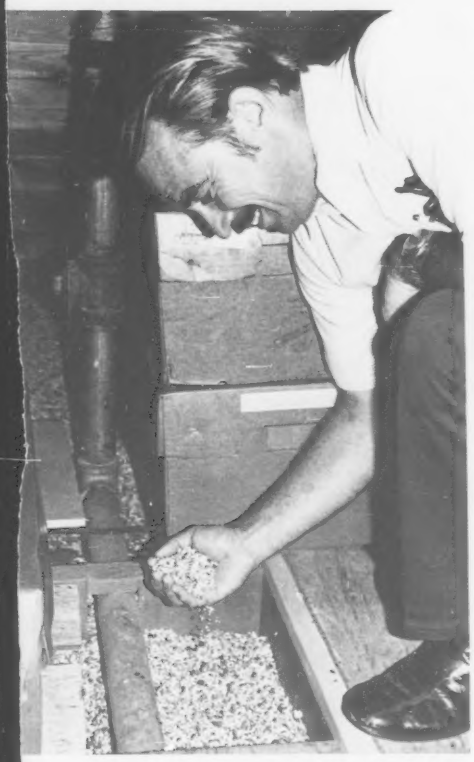
"I had just read an article in *Money Magazine*. It was about the successful program run by Princeton University Center for Energy and Environmental Studies. They had used an 'Energy Doctor'—a person who would make house calls and prescribe remedies for sick houses. I brought this idea to the committee's attention."

Want to be a Doctor?

Because of the project's deadline, the committee had to find a candidate quickly to be "the energy doctor." The doctor would have to know about construction, be able to teach, and be enthusiastic about energy conservation. Michael Bowman was chosen from 40 applicants. "He was the committee's choice," Todd explains, "because he filled the bill in every regard. A teacher of construction trades, Bowman was involved in energy conservation, and he was enthusiastic about energy conservation."

Bowman's background allowed him to get the project moving without extensive training. "By the end of the first month, I was ready to go public," he says. "The committee members introduced me to the people with agencies and programs in towns involved with conservation. Todd acquainted me with Extension operations and the materials and resources they had developed."

Bowman collected samples of insulation and conservation items, energy audits, how-to-do-it



Bowman checks attic insulation depth during a home energy audit.

publications, and a small portable display for an energy booth. The energy committee lined up the places to set up his practice. "I went to the county fair, shopping malls, hardware stores," he says, "and even a local factory."

The energy doctor in his white lab coat was an immediate hit with the public and drew crowds interested in his energy conservation message. "He had the facts," Todd said, "and his doctor routine made him easy to approach. Also, he was from Extension and I think people perceived him as unbiased."

During the summer and fall of 1980, the committee planned a series of workshops for the energy doctor. Twenty workshops were attended by 600 homeowners. The energy doctor gave them in-depth explanations of ways to conserve energy around the home. In addition, three tours focusing on alternate sources of energy were held along with special workshops on solar greenhouses and wind energy.

House Calls

House calls were at the heart of the original Princeton University Energy Doctor program. However, the energy committee decided early that the best way a part-time energy doctor could serve the Rockford community and Winnebago County in the limited time available was through meetings with large groups.

Still, a limited number of home visits were made by the energy doctor. Bowman visited 16 homes and conducted home energy audits in all of them. A followup questionnaire revealed that one-third of these homeowners followed advice and took steps to save energy. They reported that they either caulked or weatherstripped their homes as a result of the energy audit. Some had also installed water-heater blankets and flue dampers.

Evaluation

The workshops also showed a marked degree of success. In one energy conservation workshop, 9 participants out of 31 returned their followup questionnaires and all 9 reported using at least one energy-saving method in their homes as a direct result of attending the workshop.

The energy doctor's "believeability" was as important a factor in achieving results as his workshops, audits, and consultations. One respondent summed up Extension's contribution this way on an evaluation questionnaire: "The biggest benefit from your program was learning and believing energy-saving techniques from an objective source who supposedly didn't have any business interests in mind."

The energy doctor helped people decide among the different conservation strategies. The evaluation questionnaires suggest that his primary role was as an objective authority. He provided factual, unbiased information. The energy doctor was not the homeowners' sole source of information—energy advice is plentiful in magazines and on TV—he was just the most believable.

Implications

"The simple idea of calling the project leader the energy doctor," says Joan Todd, "gave our project high visibility from the start. Our doctor analogy caught on immediately with the press and we got a lot of valuable coverage. The public found it easy to figure out what the energy doctor's message was all about."

Temporarily, Michael Bowman has turned in his black bag and white jacket and retired his practice. During the year the energy doctor practiced, more than 7,000 people consulted with him and learned ways to relieve the pain of high energy prices with effective remedies for their energy-wasting homes.

"The energy committee and our county staff are looking for ways to bring the energy doctor out of retirement," Todd says. "His house calls and workshops proved to be cost-effective tools—good medicine—in the fight against high energy bills."

Saving Water Makes Energy Sense

James K. Wolfe
Writer-Editor
Extension Information
Washington, D.C.

Irrigation scheduling—applying the precise amount of water at just the right time to maintain economic crop production—will be a reality some day for nearly all of Nebraska's 7.4 million acres of irrigated farmland.

"The economics alone ensure that irrigation scheduling will be used on 95 percent of the irrigated farmland," predicts Paul Fischbach, Extension specialist on irrigation at the University of Nebraska.

"The savings gained from this water conservation practice would be more than substantial," he says. "Approximately $123 million would be saved in the state in fuel to power pumps and $55 million in fertilizers. The estimated $2.50 an acre farmers would pay for irrigation scheduling could trim at least 35 percent of their costs for water use and fuel bills."

If irrigation scheduling was applied to all the acreage in Nebraska that needs it, Fischbach says, the savings in energy would be equivalent each year to 120 million gallons of diesel fuel. At a cost of 91 cents per gallon, irrigation scheduling could save $109 million in energy anually. There could also be an important conservation of 54 million "acre-inches" of water. (An acre-inch is the amount of water needed to cover 1 acre with water 1 inch deep.)

For example, more than 100 of Clay County's 675 irrigation farmers practice some form of irrigation scheduling to prevent wasteful and costly overwatering of their crops—primarily cash grains.

Extension programs have encouraged the use of several water conservation techniques for improving irrigation systems. Among them are:

- *Soil moisture blocks.* These moisture blocks, equipped with electrical meters, inform farmers of the amount of moisture in the soil available to growing crops, and signal the proper time to irrigate.

- *Water meters.* When installed on an irrigation well, these meters ensure that the farmer doesn't use more water than the moisture blocks indicate is necessary.

- *Water conservation* during irrigation. Cutting water use per acre when irrigating can prevent the washing away of valuable nitrogen fertilizers from the root zone.

- *Tailwater reuse systems.* Reuse (tailwater) systems are now mandatory if the irrigator is using ground water. Nearly 50 percent of the surface irrigated acres have such a system; this recycling of surface runoff has resulted in a savings of 12 million "acre-inches" of water not being pumped from the ground water reservoir.

- *Automatic gated pipe systems.* More than 4 million acres are surface irrigated by gated pipe or siphon tubes in the state. Although installation costs are high, this system prevents excess water usage and automatically provides a water application and uniformity of 90 percent.

- *Furrow smoothing.* When this method is used on surface irrigated fields, in conjunction with automatic gated pipe, about 5 inches of water can be saved per acre. Furrow smoothing is now being used on about 1 million acres in Nebraska and has resulted in a savings of more than $7 million dollars in energy costs.

- *Low pressure nozzles.* New center-pivot sprinklers are equipped with medium- or low-pressure nozzles that reduce pressure by about 28 pounds per square inch. About 133,000 acres in Nebraska switched to the lower pressure nozzles in 1980 resulting in an energy savings of nearly $900,000. Extension specialists estimate that if 25 percent of the center pivots were changed, producers could save $4 million dollars in energy costs.

Adjusting The Pumps

Tests revealed that the average pumping plant used 30 percent more fuel than it should because of improper adjustment, worn out pumping plants, or other changing conditions.

To correct this situation, Extension specialists held an irrigation pumping plant workshop to teach 66 potential testers how to engineer and test a pumping plant and how to analyze the various problems in order to make the necessary changes in equipment and the required adjustments.

"PUMP," a pumping unit management program, was recently conducted throughout the state at the request of county Extension agents. Extension held 69 demonstrations in 62 counties and more than 3,000 people attended. Two pumping plant testing teams conducted the tests, analyzed, and made adjustments to pumping plants. The audience consisted largely of irrigators with pumping plants, consultants, well drillers, and engine motor manufacturers.

"PUMP" resulted in 57 pumping plants being adjusted. Their efficiency was raised an average of 14 percent. The average diesel unit that was adjusted saved the irrigator $434 a year. One irrigator estimated a savings of $1,200 per year in diesel fuel. Also, 66 consultants, well drillers, and engine and motor

The use of automatic gates is one of the many effective methods of conserving water in irrigation. Allen Dedrick, an agricultural engineer with the Agricultural Research Service, observes the operation of a jack gate that opens and closes by means of a piston-type air cylinder on command from centrally located timeclocks.

specialists were trained to test pumping plants as a result of the program.

Computer Scheduling

A new research project of the University of Nebraska—Lincoln Water Resources Center, funded by the Department of Interior, will concentrate on developing a computerized irrigation scheduling program for corn and soybeans.

This computerized program will pinpoint crop growth stages where water is critical to producing satisfactory crop yields. Current computerized scheduling programs consider only climatic and soil moisture conditions.

"They fail to consider the plant's point of view," says George Meyer, professor of agricultural engineering in the UN Institute of Agriculture and Natural Resources, who is developing the new program. "By adding in the crop growth factors," he says, "the new program will prevent unnecessary irrigation during growth states when the plants don't need much water."

Paul Fischbach, Extension irrigation specialist, will work with Meyer on the project to document potential water and energy savings the program can offer corn and soybean growers. Estimates have the new computerized irrigation scheduling technique ready for public use in 3 to 4 years.

Fischbach concedes that it takes money and effort to start irrigation scheduling. "It's a learning experience," Fischbach says, "and it takes about 3 years to make it work for you. Irrigation requires more energy than any other farm operation in the state. Improved efficiency reduces energy use, saves farmers dollars, and helps conserve a precious resource . . . water."

The improper use of a woodstove can cause a fire severe enough to destroy a house.

For the pioneer family, the wood-burning stove was a focal point in their struggle against the elements. The old pot-bellied stove warmed their hearts and hearths as they settled the prairie or hunted the forests of the Great Lakes.

The popularity of using wood-burning stoves has once again soared as modern Americans rediscover this method of saving fuel costs.

Used properly, a stove provides a home with cozy warmth and the soothing crackle of wood characteristic of the considerably less efficient fireplace. But many people install and use wood stoves without heeding the necessary safety precautions.

This move often ends in disaster.

In Michigan during 4 winter months last year, for example, the improper use of wood-burning stoves had tragic results. According to the state police fire marshall, there were 18 deaths, 235 injuries, and 2,478 fires, and $8 million in property losses.

In 1977, the Michigan State University Cooperative Extension Service (CES) began conducting safety programs for wood stove users. Two years later, they gave the programs statewide emphasis and published a series of bulletins, prepared visual aids, and display materials, and held many public meetings.

Last year, CES intensified its efforts even more in the Upper Peninsula (UP) in a program called "UP IN SMOKE" with the cooperation of the Upper Peninsula Loss Prevention Association and three fire insurance companies.

The sponsoring companies created the Upper Peninsula Loss Prevention Association to handle all campaign expenses and income. The Independent Insurance Agency Association contributed $1,000 and $10,500 came from the three cooperating insurance companies.

The results? One of the insurance companies reports a 50-percent reduction in fire loss due to wood stoves. They attribute much of that reduction to the CES "UP IN SMOKE" safety program.

The new UP program began as a cooperative effort when insurance company representatives met with CES staffers Keith Raisanen, Jim Krenek, and David Olson, project leaders. Jackie Braver and Jayne Marsh of the Michigan State University Information Services assisted in the project development. The group developed a tentative budget and a proposed media campaign.

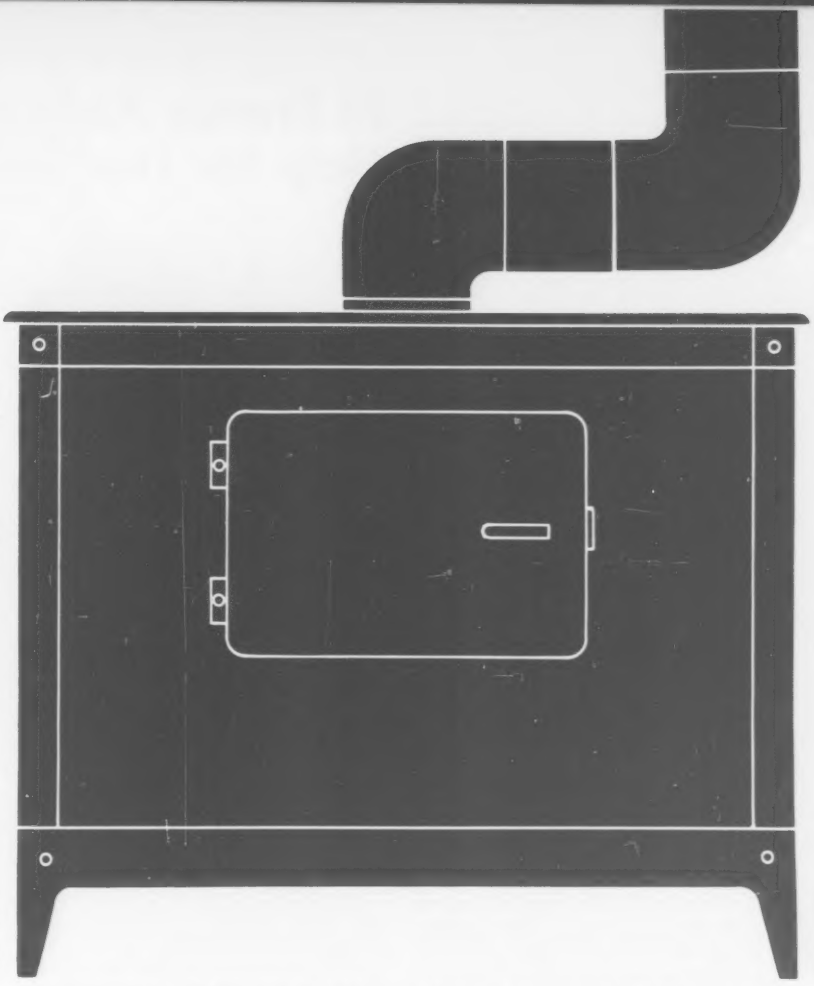
Campaign

A media campaign through a commercial advertising company was designed to reach young families in the Upper Peninsula where most of the fire loss occurred. With an approximate budget of $11,500, the company purchased media time during a 3-week period coinciding with National Fire Prevention Week, September 29 to October 17. During the following 3 weeks they used free public service announcements.

Designed to place 418,477 advertising impressions, the campaign targeted the 18- to 49-year age bracket an average of six times each. The media campaign included 31 30-second prime-time television spots, 400 prime-time radio spots, and 17 newspaper ads.

The insurance companies purchased 35,000 copies of four CES bulletins on wood stove safety which the 14 Extension offices distributed to independent insurance agents on the Upper Peninsula.

David D. Olson
Cooperative Extension Service
Michigan State University



MSU Information Services staff developed the campaign logo UP IN SMOKE and wrote 16 suggested educational announcements. Robert Neumann prepared special features. Olson and Raisanen developed the radio and television announcements using basic scripts developed by Information Services, and the county Extension staff wrote many news releases on UP IN SMOKE, emphasizing wood stove safety for a 7-week period.

Public Meetings

Public UP IN SMOKE meetings were held in 30 locations for 1,200 people. Materials were used by three exhibitors at the UP Energy Exposition which, attracted more than 8,000 visitors.

Six radio public service announcements were written, taped, and distributed to 30 radio stations for use from October 18 to November 7. The television paid announcements were retaped as public service announcements and were still being used in April 1981.

The Upper Peninsula Fire Chiefs Association helped publicize the campaign in their newsletter. They originally wanted to offer home safety inspections, but some fire departments were concerned about liability after inspections and felt poorly trained to conduct inspections.

A number of fire departments conducted in-service training for their employees using CES film and slides. Three fire departments cosponsored public meetings.

Extension staff conducted about 25 public meetings. Others included one by fire department personnel and two by the Northern Michigan University Free University program.

One constant problem was the short timespan between initial idea time and program time. The staff suggest at least 3 months advance time for any similar programs.

Evaluation

Extension staff say the ultimate success of UP IN SMOKE will relate directly to the combined effort of using purchased media, public service announcements, bulletins, displays, new articles, news columns, and public and agency meetings. The involvement of the 14 county Extension staffs was also very important.

A number of the public meetings involved local building code and fire department personnel as resource people. That helped to make a better meeting for the public and provided an in-service training opportunity for them.

An evaluation form was developed and distributed to insurance agencies and county Extension offices. The general comments received from county Extension offices, insurance agencies, fire departments, building code inspectors, and the general public have been favorable. Although the evaluation form returns have been slow in coming back, it appears that Upper Peninsula residents are now more aware of wood burning appliance safety.

CES staffers say that the final evaluation of UP IN SMOKE will not be complete until the 1981-82 heating season is past. When the fire statistics are available, they hope to be able to report even better results.

ES Energy Assistants—Help for Homeowners

Skyrocketing fuel costs and anticipated future increases have forced many families to spend a larger percentage of their income for space heating, water heating, and home improvements.

In desperation, some people are turning to any source of help available—whether reliable or not. In Indiana, Cooperative Extension has made the search for reliable information somewhat easier for people in the southeastern part of the State through a new Rural Energy Conservation Program (RECP).

For example, a young couple who rent a small rural home recently called the Extension office asking for help. "We spend over $800 a year on gas and we're still cold," they said. A recently hired Energy Extension Assistant (EEA) visited the young couple and found a pre-World War I house with no insulation, poor storm windows, and a leaky roof that had been repaired with a plastic sheet. Also, the couple vented their gas-fired clothes dryer to the inside so that they could feel warmer. They tried to help themselves by installing plastic on the inside of their windows.

The couple needed information to help them convince their landlord to do something to make the house more energy efficient. The EEA spent time interviewing the couple. He examined the general condition of the house—including structure, insulation levels, water and home heating systems, and other energy consumption practices of the family.

Before the EEA left the house he warned the couple of the danger of venting their gas dryer to the inside and showed them how to correct the problem. He later returned with the energy analysis of the house, including a set of recommendations to fit their housing and financial situation.

Self-Help

The EEA's are part of the Rural Energy Conservation Program (RECP), a pilot program in five counties in a somewhat economically depressed section of southern Indiana. RECP stresses improved energy efficiency and encourages a self-help atmosphere among rural and smalltown residents. The EEA's work with families on a one-to-one basis and in small groups. They are supervised in each county by their home economics Extension agent and are part of the ongoing Extension program for that county. The RECP staff works in cooperation with the Indiana Department of Commerce Energy Policy Division, and it is supported by a grant from the U.S. Department of Energy.

The RECP is coordinated by a program director and an administrative assistant. Purdue University Extension specialists in Housing, Agricultural Engineering, Forestry, and Agricultural Economics provide backup support and technical training for the EEA's and the supervising home economists. The program began August 1, 1981 with the EEA training, and by the end of November that year the EEA's had counseled with over 120 families.

The four EEA's have varied backgrounds that contribute to the energy education program. Two have previously been Extension agents with the Indiana Cooperative Extension Service. All four EEA's have an outstanding ability to work with all types of people, to teach, to exhibit sensitivity, and to listen.

Twelve days of initial training for the EEA's over 3 weeks provided information on heat loss analysis for houses and mobile homes and appliance use costing as well as insulating and construction techniques. The EEA's also learned to operate the Fast Agricultural Computer Terminal System (FACTS) in each county office and to run the Home Insulation Analysis Program. Continued monthly review and revision supports the EEA's in their new roles.

The Home Insulation Analysis Program, along with additional heat transfer principles and calculations, is used by the EEA's to derive specific recommendations for families. One EEA, Ray Brooks of Lawrence County, saved a couple in their mid-eighties living on a fixed income between $400 and $500 a month. The couple had already decided to add more insulation to the walls and ceiling of their pre-World War I home that had had some insulation added in 1973. The EEA explained that this was not cost effective and persuaded them to stop air leaks by caulking and weatherstripping, and to have the heating system serviced.

Payback Table

In another example, the EEA was able to show a couple in their late seventies that their decision to redo the siding on their pre-World War I house would not accomplish what they wanted—"A warmer place to live." The wall insulation would have been increased by new siding with an R-value of 2.6, which would cost $1,600 to $1,800. This cost would be considerably more than the $400 needed to blow insulation into the side walls and add batts to the ceiling. The couple will be able to have a higher R-value for less coal cost and thus feel warmer in their house. The EEA also used a payback table to show them how much they

Jean W. Bauer
Carole Savitsky
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Agricultural Engineering Department
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could afford and how long it would take for a return on their investment in the insulation.

Wood stove safety is a major component of the program for Ray Peyton, an EEA in Scott county. More than 90 percent of the families interviewed heat entirely with wood or use wood predominantly with a backup system of LP gas, electricity, or oil. Peyton stresses the safety features of installing and using a wood stove. Many of the residents who have been using wood stoves for years take precautions to ensure safe use. Occasionally situations occur that indicate some people are not aware of the safety precautions needed.

Personalized

The EEA's spend about an hour with each family during the initial interview. Then they return to the Extension office to run the home insulation analysis computer program. The output includes information on the source of heat loss, insulating (R) values, typical component heat loss, and estimated heating costs for the house. The program also includes possible improvements and potential savings per year for each improvement.

Each family received a computer-generated, personalized set of recommendations. These recommendations include no cost, low, and moderate/high cost energy conservation measures, as well as a section on preventive maintenance and safety precautions. The EEA's select the desired recommendations based on the interview and observations made during the initial interview.

During a second visit with the family, the EEA's explain the output from the home insulation analysis program and outline the personalized recommendations. They answer questions and try to determine whether the family has the knowledge and skill to execute the recommendations. The families are encouraged to attend several self-help workshops provided by the EEA's and Extension home economists. Each family is responsible for any cost, both material and labor, involved in making energy conservation improvements or changes in their home environment. The project provides no financial support to the families.

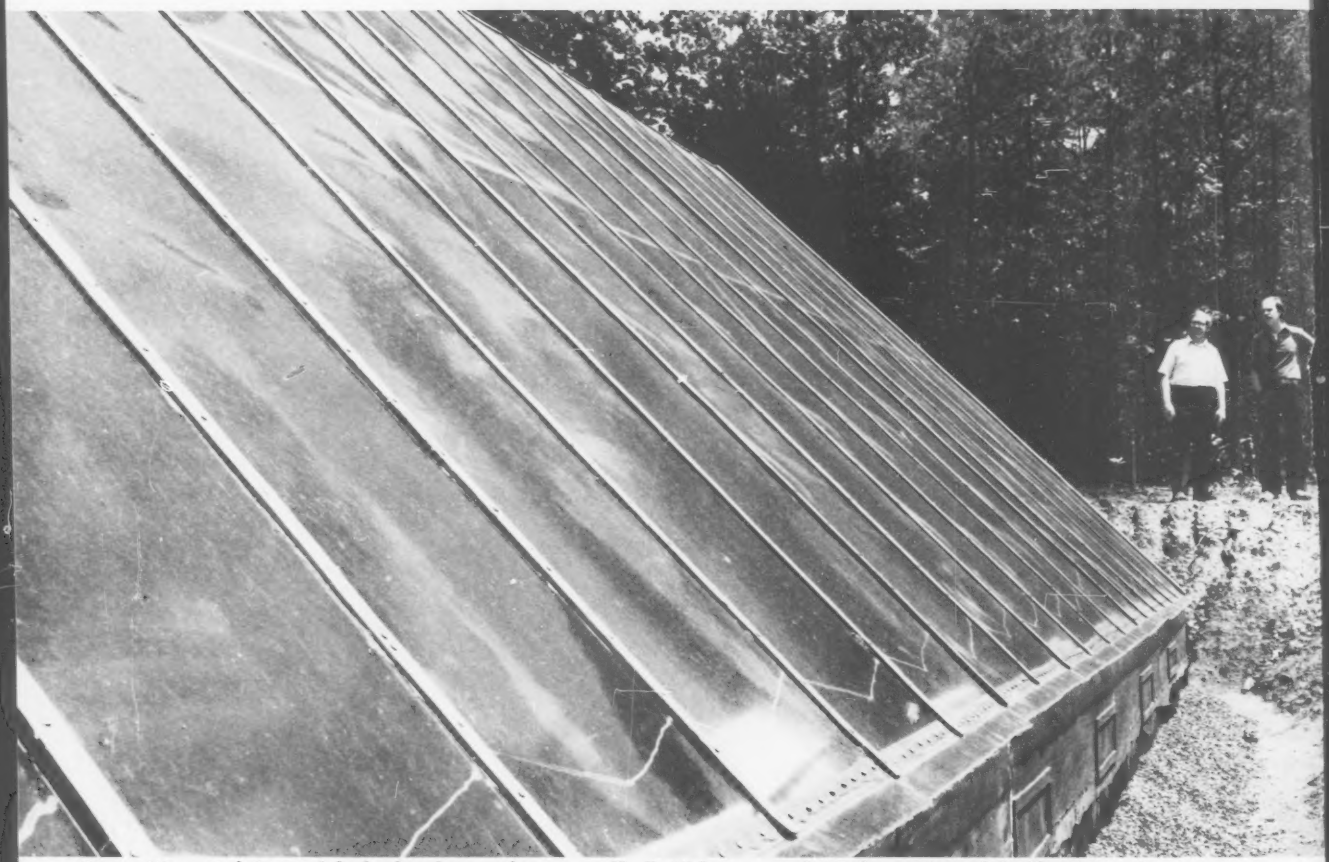
High Participation

Norman Comer, EEA in Decatur County and Bev Martin, EEA in Jennings County, report that 75 to 80 percent of all the families are making some energy conservation improvements between the initial interview and the return of the set of recommendations. One improvement is the use of foam insulators in wall electrical outlets and light switch cover plates. Others include reducing hot water temperature, caulking and weatherstripping. Most homes do not have dishwashers, yet water temperature is 130 ° F or more. The EEA's measure the water temperature and show families how to adjust it. Most families are not aware of the potential savings from reducing the hot water temperature. When the EEA's return, they check to see if the family has been able to manage with the new water temperature setting.

The initial interview, preparation of recommendations, and the followup informational session have averaged about 4 hours per family. An evaluation of this intensive one-on-one program delivery model in the pilot counties will be conducted and compared to other less intensive statewide energy management programs.

Solar Kiln Drying

Sherrie R. Whaley
Extension Service
Virginia Polytechnic Institute
and State University



Eugene Wengert, designer of the lumber dryer, and co-owner Charlie Hickox survey the 45-degree slope of the fiberglass roof.

The unspoiled central Virginia countryside near Afton Mountain might be an unlikely place to find the largest solar lumber dryer on the east coast. But nestled in a small clearing on a 490-acre tract of land known as Shannon Farm is a large-scale model of a wood dryer designed by Virginia Polytechnic Institute (VPI) and built by 10 Nelson County woodworkers.

The dryer was originally designed, constructed and tested at VPI by Eugene M. Wengert, Extension specialist in wood technology, and represents a major breakthrough in the field of lumber drying.

"An all-electric 2,000 board foot kiln, with a small electric boiler, would cost over $30,000," Wengert says. "My design requires only a small investment and no energy, other than solar, except for a few household window fans used to circulate the heat."

Businesses that use small amounts of lumber usually buy their wood already kiln dried instead of buying cheaper green lumber because a dry kiln is a major capital expense and today's rising energy costs have made small-scale drying impractical.

Fast Drying Time

Based on 18 years of research and development, Wengert's solar lumber dryer has made it possible for the small wood user to purchase green lumber and dry it in approximately 30 days to 7-percent moisture at very little cost. The kiln research was supported by funds from the USDA Forest Service and the Northeast Forest Experiment Station.

The dryer uses a passive solar collector, similar to a greenhouse, four insulated walls, and an insulated floor. The roof is fiberglass or clear

Top: Wood shavings rain down on a member of the Shannon Farm community as he operates a mobile dimensional sawmill brought from Pennsylvania.

Above: Wengert and Hickox discuss the moisture content of lumber processed in the solar dryer.

plastic sloped at a 45 degree angle to the south. (The optimum angle depends on the latitude where the dryer is located.)

Solar energy enters the dryer through the clear roof and falls on one of the black-painted interior surfaces. The energy is converted to heat and is then circulated through the lumber pile where it is used to evaporate water. To conserve energy, the fans are controlled by a thermostat to run only when the dryer has been heated above 65° Fahrenheit in winter and 75° Fahrenheit in summer.

Unique Design

Owners of Heartwood Design, a Nelson County woodworking business, became interested in solar kilns several years ago and they contacted Wengert. Using his design, they constructed a solar kiln capable of drying 25,000 to 30,000 board feet of lumber per year.

Company spokesperson, Charlie Hickox, says that the business will use about 5,000 board feet a year in their cabinetmaking and woodworking. The remaining wood will be sold to school systems for shop classes, cabinetmakers and woodworkers within a 50-mile radius. "Unlike a big lumber yard, we will sell any amount of wood," Hickox says. "We set no limits on quantity."

The most common woods dried in the Heartwood solar kiln are red oak, white oak and poplar, either cut from Shannon Farm or bought locally. Woods not grown locally must be purchased from larger distributors.

When drying lumber, it is wise to monitor its moisture content to avoid drying too rapidly. Too rapid drying can cause the wood to split. Moisture is measured by weighing the sample boards and the daily rate of moisture loss is compared with a "safe rate" chart developed by Wengert for various species of wood. To avoid drying too fast, it may be necessary to block off part of the collector, or turn the fans off and open vents during the hottest part of the day.

Heartwood Design is the first Virginia business to try Wengert's design on such a grand scale. By having their own dryer, the central Virginia firm has eliminated the costly middleman and can realize even further profits by selling excess lumber to area schools and businesses.

The VPI dryer successfully controls expenses through its functional, reliable design and its use of a free source of energy. It permits small firms to dry their own lumber—something they could not afford to do before.

Energy Exposition In the Sunshine State

M. F. Smith
J. Townsend
J. Hebert
J. Masteryanni
*Florida Cooperative Extension Service**

The cost of energy continues to skyrocket. From 1973 to 1978 the increase was 96.2 percent and in 1979, alone, 37.4 percent, according to the U.S. Office of Consumer Affairs. In comparison, other basic necessities rose by the following amounts in 1979: housing, 17.4 percent; food, 10.2 percent; and health care, 10.1 percent.

In Florida, the Cooperative Extension Service is helping homeowners decrease energy costs by providing a variety of informal public educational programs. In 1979 and 1980, Extension staff held energy expositions in several Florida counties. They provided information about energy conservation, principally "productive conservation." Productive conservation differs from "curtailment" and "overhaul," both of which require major changes in the ways citizens live and work. Productive conservation asks citizens to make adjustments in their daily behaviors that promote energy savings in a manner that is economically and socially nondisruptive.

The goal of the Florida program is to reduce the amount of energy used to perform tasks rather than to eliminate the tasks. Examples of such adjustments include insulation (walls, water heaters), window treatments (films, draperies, double panes), efficient appliances, effective landscape plantings, wood stoves/heaters, water-saver shower heads, efficient light bulbs, efficient cars, and alternative sources of energy.

Energy education enables individuals to make proper choices on how to effectively use conservation treatments. The Florida CES conducted a study to determine the effectiveness of three informal expositions in helping individuals to make the choices and to follow through on the actions for energy-conserving changes. The following is a summary of the findings from the three programs. Write to M. F. Smith for the complete report. Her address is 311 Rolfs Hall, University of Florida, Gainesville, Florida 32611.

Results

In November 1979, the Brevard County Extension office held an exposition in a large, popular shopping mall where 56 sponsors and organizations exhibited techniques and communicated messages about energy conservation. Approximately 80,000 persons visited the mall during the 2-day event.

Four months later, the Orange County Extension Office sponsored a 4-hour, hands-on energy workshop at the Agricultural Center. More than 1,000 persons attended activities set up for small groups: lectures, how-to demonstrations, exhibits, and a solar water heater built at the workshop.

In May 1980, 50 exhibits were set up at the Charlotte County exposition held at a new shopping mall in Punta Gorda, Florida.

The Brevard and Charlotte Expos required little or no active participation from onlookers; the Orange Workshop goal was active involvement of the attendees and was geared to personally assist individuals with their concerns about energy conservation.

All three events received onsite evaluations and 6-month impact assessments. The onsite evaluation of the Brevard Expo was more comprehensive than the other two, but all were similar in that individuals were randomly selected for interviews as they were leaving the events. Volunteers interviewed 593 people (312 in Brevard, 130 in Orange, and 151 in Charlotte).

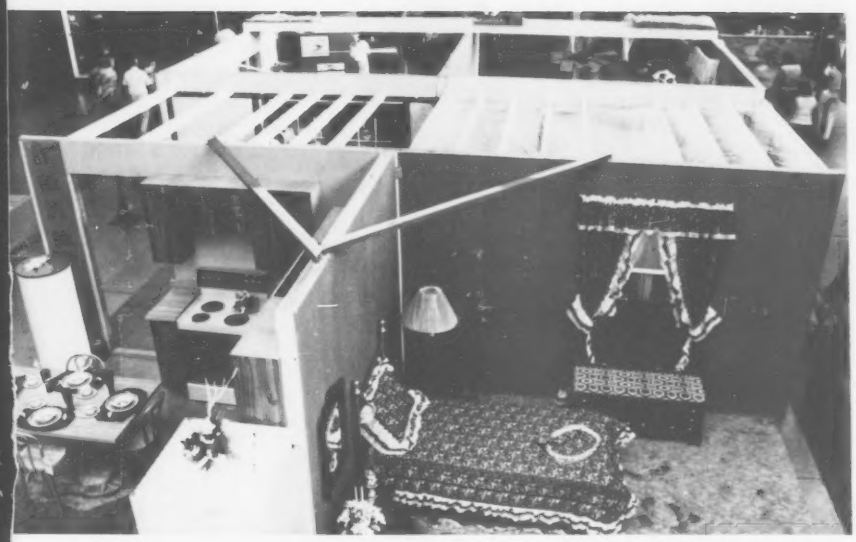
The majority of interviewees at Brevard (61 percent) and Charlotte (56 percent) said they were influenced by the Expos to go to the shopping centers and the Expo was the only reason persons went to the Ag center in Orange. At all three events, interviewees rated the Expos as very worthwhile and said they had gained practical suggestions that would help them conserve energy.

Six months after each of the events, staffers sent questionnaires to the interviewees who granted permission for the followup and to an equal-sized stratified random sample of persons selected from the geographic areas resided in by the interviewees. The Brevard control group was also occupationally matched to interviewees.

In Brevard, 150 interviewees provided information for the followup; 91 percent of these responded to the mail questionnaire and 74 percent of the random group answered. In Orange County, 102 interviewees agreed to the followup; 90 percent of these responded and 61 percent of the random group concurred. In Charlotte, 103 persons granted permission for the followup; 84 percent of them and 70 percent of the control sample returned the questionnaires.

Attempts were made to contact by telephone approximately 20 percent of the individuals who had not responded to two followup letters to the initial questionnaire. Half of these had disconnected phones or did not answer after three tries. The others gave responses that indicated little if any energy conservation interest or activity.

Individuals in the random sample who had attended the energy expositions were eliminated from the comparisons since the intent was to



Built for the Brevard County Energy Exposition, this exhibit demonstrated how a six-room home can be made more energy efficient.

compare changes Expo attendees made with similar changes made by a random group who had not attended the Expo.

The questionnaire contained three items in addition to demographic data questions. One asked how much of a problem (none, small, medium, large) the energy situation was for (a) the individual and family, (b) the local community, (c) the state, and (d) the Nation. A second item listed several steps to reduce energy use and asked how much effort (big, medium, small, none) was being made on each. The third asked what energy-saving changes had been made in and around the home since the date of the energy programs. The results follow.

Results

More of the persons who attended the Expos made energy-saving changes than did those who did not attend. However, there are limitations to saying the differences were the direct cause of the expositions or that the changes reported represent all that occurred. For example:

- The persons interviewed on the site may not have been representative of all those attending the programs. The ones who provided their names and addresses for followup may not have been representative of those who do incorporate changes as a result of having attended the programs.
- Attendance at the programs may have been a contributing factor for some individuals to make changes but it may not have been the only or the primary factor.
- Individuals say and do different things; the changes as reported on the followup questionnaires may not have occurred.
- Some individuals may have been stimulated at the expositions but not have made changes until after the followups—which mean the Expos would have more positive effect than was measured.

Conclusions

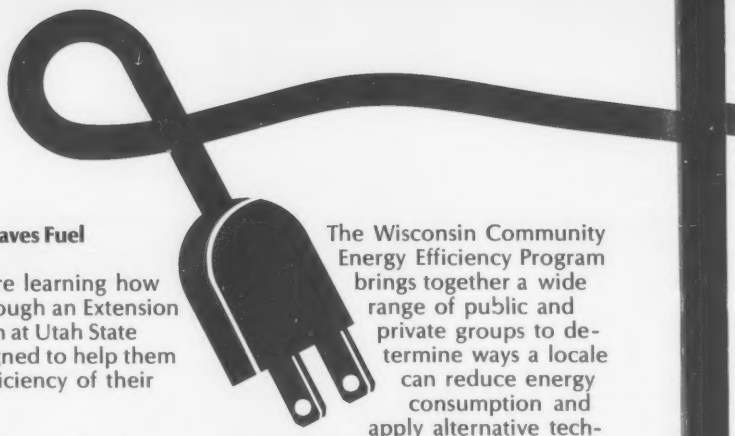
In spite of these limitations, though, some conclusions do seem appropriate:

- People will make a special effort to learn about energy conservation.
- The expositions reported in this study were considered effective learning experiences by the attendees. Most of the interviewees said the Expos gave them a better understanding of the energy situation as well as practical ideas or suggestions that would help them conserve energy in their own situations.
- The expositions apparently were contributing factors in individuals' decisions to make energy-conserving changes. Within 6 months following the programs, more of the attendees took action to reduce energy use than did the nonattendees.

The expositions provided evidence for attendees that an energy problem does exist and suggested alternative ways of dealing with the problem. The focus of the information was on helping individuals to make adjustments in their daily behaviors to reduce the amount of energy used in activities. Such information may not in and of itself cause people to make changes to conserve energy—people do not make changes in their practices just because they know that they should nor because they know how to make whatever changes are required. However, knowing they should and knowing how to make changes are *important first steps* toward decisions about change.

**All authors are employed in the Florida Cooperative Extension Service. Smith is Assistant Professor and Program Evaluation Specialist, Program Evaluation and Organizational Development, University of Florida; Townsend is Energy Agent, Duval County Cooperative Extension; Hebert is County Director, Orange County Cooperative Extension; and Masteryanni is County Director, Charlotte County Cooperative Extension.*

Energy Odds and Ends



Peanut Oil Fuels Georgia

Farmers in Georgia produced 800,000 tons of peanuts last year, using an average of 472,000 BTUs to dry each ton, with conventional methods. Based on 90,000 BTUs per gallon of propane, that means it takes 4,615 gallons to cure the crop. Extension engineers have begun educational programs and demonstrations, supported by funds from the State Energy Office, that show how farmers can cure peanuts using less fuel than they do now. The engineers are distributing circulars describing these methods and they estimate farmers can save 5 percent of their energy costs.

Georgia Extension Service engineers are also providing facts to farmers on how to use biomass to dry grain and how to use peanut oils to extend or replace diesel fuel. Three specialists, Cecil Hammond, Bobby Tyson, and Lawton Samples, along with researchers such as John Goodrum, are evaluating peanut, soybean, and sunflower oils for use as fuels.

A small diesel engine using peanut oil has been a hit at field days and on exhibit throughout the state. A residue burner that burns big bales or stacks of cotton, corn and soybean stalks is also being demonstrated. The Georgia Agricultural Commodity Commission for Peanuts supplied a grant for machine purchase.

Goodrun, with the agricultural engineering division, is working on how to process oil for use as a fuel in tractors. Peanut oil is one of the better vegetable oils for this use because it is the highest yielding per acre of the common vegetable oils and also has the highest heat content of these oils. □

Tractor Testing Saves Fuel

Utah farmers are learning how to save fuel through an Extension Service program at Utah State University designed to help them increase the efficiency of their tractors.

As part of the Tractor Testing Program, Extension has conducted more than 100 clinics since 1976 and tested and adjusted more than 1,000 tractors to improve their horsepower. The increase in horsepower to these tractors is equivalent to placing an additional 155 tractors of 100 horsepower on the farms of Utah. The value of the increase is estimated to be $3,377,000 with a calculated fuel savings of approximately 301,000 gallons.

The program consists of a series of two-part clinics. The first part is an evening meeting in which farmers learn tractor maintenance principles. The second part is held the following day and tractors are tested at a central location using a dynamometer. Von Jarrett, Extension agricultural engineer, conducts the clinic involving tractor dealers and their mechanics whenever possible.

With the aid of the dynamometer, Von Jarrett determines which adjustments or repairs are needed to bring the tractor to an efficient operating level. If this can be done through adjustments, they are made during the clinic. Major repairs are part of recommended maintenance programs. □

Working Together

The community that saves energy together stays warm together. That's the idea behind a plan developed by Extension at the University of Wisconsin.

The Wisconsin Community Energy Efficiency Program brings together a wide range of public and private groups to determine ways a locale can reduce energy consumption and apply alternative technologies. Aimed at the residential, transportation and governmental sectors, the program includes a university faculty group which acts as advisors in the following areas: agricultural economics, home economics, architecture and urban planning, landscape architecture, transportation, adult education, and engineering. Educational materials are being developed to present to community groups. Extension will select a number of locales this spring to participate in the program. □

A Cold Rocky Mountain High

Winter in the Rocky Mountains of Utah gets cold, colder, coldest. Winter in Sevier County starts in November and stays cold through March. Of immediate concern to everyone in and around Richfield, including Extension home agent Margaret Older, is how to stay warm while turning down the thermostat to save money. Even the public buildings were colder inside last year in efforts to cut heating costs. In the high school, teachers noticed subtle problems in learning due to colder classrooms. It is recommended that county residents turn down their thermostats 4°F, and Older taught them how to maintain that 4°F in body surface temperature and stay comfortable.

After researching the data on weather and costs (degree days, electric rates, etc.), she developed an educational program and conducted it in various areas of the county, attended by 194 teens and adults. First, were discussion on the impor-

tance of wearing clean clothes which trap more air near the body surface that do dirty clothes. That led naturally into talking about conserving energy while doing the laundry.

The second part of the program was on how to dress for warmth. A display of various types of clothing was a part of the exhibit. A long-sleeved cardigan sweater was tagged "+3.7°F"—indicating it would add that much warmth to the wearer and he or she could turn the thermostat down that far and still be just as comfortable. Long pants would add 1.5° while a skirt would make you feel 1.5° cooler. Various wardrobe combinations and their temperature effects were discussed. Lowering the thermostat and dressing warmly could mean a 12-percent savings. Thus, by using recommendations outlined in the program, each of the 194 households in the audiences could realize significant savings, especially during the 5 heavy heating months in Rocky Mountain high and cold country. □

Landscaping for Energy

Houses designed for low-energy landscaping cost about 20 percent less each year for "comfort conditioning" than houses designed without this feature in mind, says Dennis E. Buffington, associate professor of agricultural engineering at the University of Florida.

In an article, "Proper Landscaping for Energy in Buildings," in *California Landscape Management* magazine, Extension specialist Buffington points out landscaping features to be considered when conserving energy to cool and heat residential buildings. They include: wall and roof shading; wall and roof exterior colors; and building orientation. □

Making Fertilizer from Thin Air

The University of Nevada's Gund Research and Demonstration Ranch is working on a unique nitrogen-making machine. The project is a cooperative effort between the university's College of Agriculture, the Kettering Research Laboratory of Yellow Springs, Ohio, and others. The machine converts nitrogen from the air into calcium nitrate fertilizer on a scale suitable for small farmers in developing nations. The unit does not use fossil fuel.

The prototype in Nevada uses a hydro-turbine generator powered by water piped more than a mile from a canyon, building up water pressure. The turbine provides an electrical arc which produces nitric oxide from the air. It is then combined with water and limestone to produce fertilizer. Byproducts of the process are electricity for home use and heated water for warming a greenhouse.

Because of the bad drought of 1981, a lack of runoff water to power the turbine caused the cancellation of field day plans and some testing. However, the machine does work and the theory is sound. Hopes are high that 1982 will be the first real full-season test year. In the future, larger models of the prototype could have important applications to American agriculture. □

Energy Superstars Teach Ohio Youngsters

In Ohio—with cold winters and hot summers—many people have grown tired of hearing how they must save energy. In Allen County (Lima), Nancy Layman, county agent for home economics, felt if people learned about energy conservation when they were young, their habits would continue into their adult years. Children, too, by the things they do influence their parents' behavior. So, in 1980 she developed "Energy Superstars, A Learning Packet for Children." It is now used sucessfully by teachers and other Extension agents.

The packet is produced for use with preschool and kindergarten youngsters so that teachers and parents become involved, too. Fourteen activities are included in the packet, with patterns for visual aids. Each activity has an evaluation sheet. Activities include: puppets; bulletin boards; glad and sad lightbulbs; picture search; a theme song; a story; a checklist; and a certificate. Different methods were used to advertise the packet beyond the pilot test area of Nancy's county. Because of letters sent to teachers, and mentions of "Superstars" in other Ohio agents' newsletters and newspaper articles, the packet has been very well received.

Evaluation sheets indicate the activities and materials are suitable for the chosen young age group. Many homemakers say they plan to use the packet. Working with small children, parents, and teachers may well be the way to change the attitude of the American public toward conserving engergy. □

"CHEC"-Mating High Energy Costs

Both community energy groups and church groups in Steuben County, New York, are carrying out low-cost energy-saving projects because of the educational efforts of Steuben County Cooperative Extension.

The program—called CHEC (Community Home Energy Conservation)—mobilizes area residents to take steps themselves to lower energy costs. Five communities in the county are initiating

community energy projects as a result of CHEC's efforts. CHEC presents free clinics for area residents to demonstrate low-cost and no-cost energy-saving strategies.

Representatives of eight different area churches attended a recent CHEC program, and as a result, one of them has already developed an energy conservation improvement plan. Because of the success of CHEC and other county energy programs, a County Energy Task Force is being set up to make recommendations for policy at the county level. □

Out of Hot Water

Extension helped some Tennesseans out of hot water last year! The use of flow restrictors on showerheads was only one of the many conservation tips offered to the homemakers of Lauderdale County in a successful program called,"There's More To It Than Meets The Eye."

"Hot water accounts for a large share of a household's energy bills," says Jane Connell, Extension home economist, "but homemakers at the program showed they were ready to do something about it. Sixty-six of the 189 homemakers attending the program reported a total savings of $370 monthly through the use of conservation tips." These ideas included lowering of thermostats on water heaters, complete shutdown of water heaters when homemakers left their houses during extended periods, as well as installation of shower flow restrictors. The program's audience reported sharing the good word about energy conservation with 163 of their neighbors. □

Portable On-Farm Ethanol Pilot Plant

Extension agricultural engineer Darrell Roberts—and others in the Agricultural Engineering Department at Clemson University—designed, constructed and did initial operation of a farm-sized still for ethanol production. In the last decade the idea of energy independence has been foremost in the minds of many people. The concept of each farmer being energy independent has been a never-achieved goal—but producing ethanol (ethyl alcohol) on individual farms had gotten attention as one way to reach such a goal.

The science of ethanol production is well documented for large-scale, commercial operations. Producing it in small, farm-sized plans has not met with much success (except for illegal moonshine operations). Most available designs for farm-sized stills are scaled-down versions of large industrial plants—and their relative success is controversial. The Clemson design is much different in scale and approach. For one thing, since the raw products to be tested are various South Carolina farm products, the entire still was built in a 44- by 8-foot drop-deck trailer. Thus the still can be operated at different Experiment Stations in different cropping regions of the state. The "breakdown" time needed to get the still ready to transport is about 2 hours, and an equal amount of time is needed to set it up at a new location.

Other flexibility was a part of the general design criteria: Heat from either fossil fuels or a renewable fuel such as wood; alternate uses of heat; reasonably simple operational requirements; materials and construction requirements compatible with and available to the capabilities of most farmers. The finished, yet not perfected, portable still was used for three 1-day demonstrations last September—at three locations. Besides operation of the still through the whole sequence, major problems were discussed. Those involved in the project say that small-scale ethanol production isn't a science . . . yet . . . but they are working on it.

More on Stills

"People should check out performance specs of their farm stills and count on making less alcohol of lower proof, unless they're expert," says James W. Garthe, Extension agricultural engineer at Pennsylvania State University. Garthe advises on the dangers of alcohol production for fuel as he travels around the state answering questions.

Garthe doesn't intend to be discouraging, but he wants to let farmers know that alcohol production is not easy. He points out that farmers must modify a gasoline engine three ways if they expect it to run on straight alcohol. First, they must drill out the carburetor jets to furnish more fuel, since alcohol contains less energy than gas. Second, people must keep a dual-fuel system with a dual-carb manifold to start on gas or add a manifold preheater. And third, the manifold must be shielded to assure vaporization while the car is moving.

Cooperative ventures appear more economically favorable than farm stills for alcohol production, he says, because the co-op would spread out investment risk and few farmers have the time or expertise to tend a still. □

Clowning Around to Save Energy

Judith Bowers
Information Officer
Extension Service
Washington, D.C.

Home economists in the Louisiana Extension Service are trading on youngsters' love of clowns to take an energy conservation program to the state's second graders. Five hundred voluteers, identified as Enerjean the Clown, were recruited and trained by the Extension home economists. The volunteers sewed their own costumes from a design by the Extension staffers.

During 1980, when the Enerjean program began, the clowns entertained 82 percent of the State's 86,000 second graders. Volunteer Annette Hagg chaired the program, Margaret Brewer headed the Louisiana Extension Homemakers' Council in 1980, and Betty Wood, associate specialist, Homemaker Council coordinator, is Extension adviser for the project. Other Extension staffers closely involved include Carolyn Carter, associate specialist, family resource management; Margaret Moore, associate specialist (energy); and Ruth Thompson, specialist, communications.

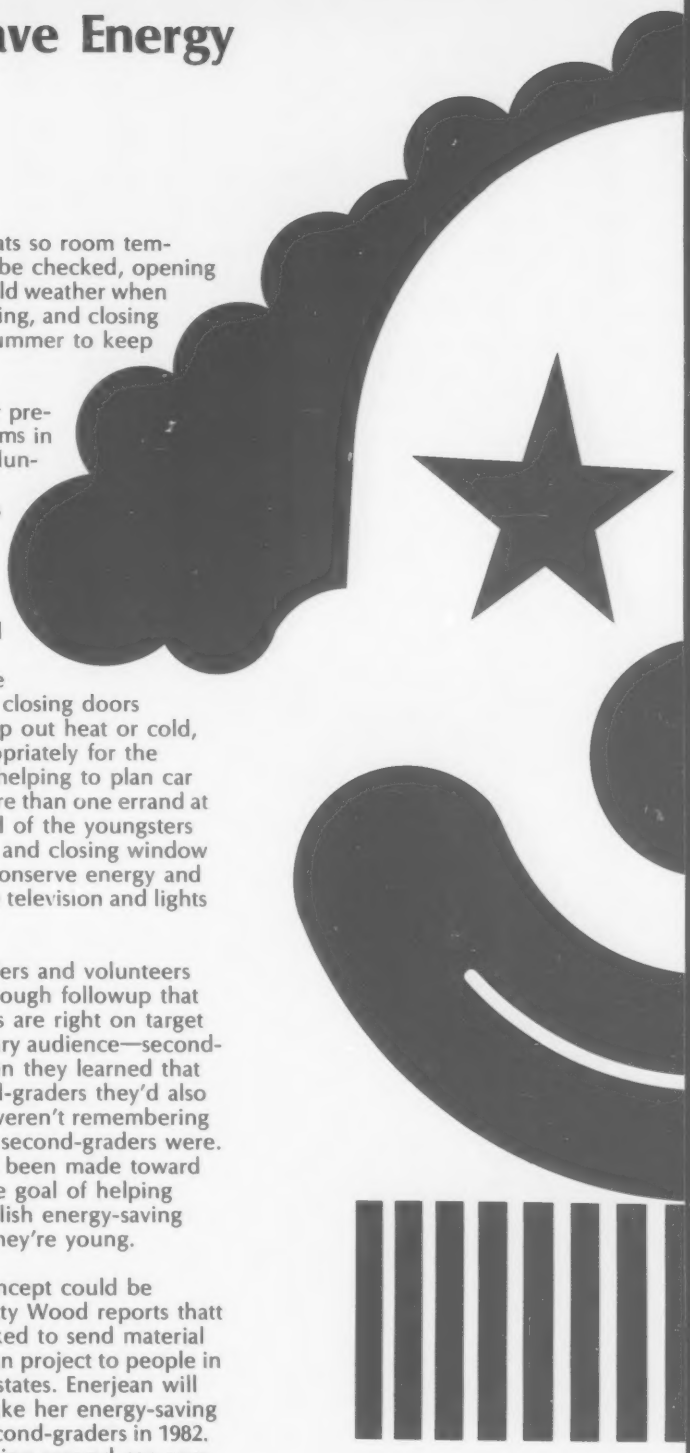
To help the children retain the concepts, the clowns convey simple messages about energy: keep doors closed, wear more clothing when it's chilly, turn off TV sets that aren't being watched, and walk or bike whenever possible.

Enerjean has become so popular that the clown has appeared on radio and television talk shows and also in ads to announce when the Enerjean program will be coming to the next Louisiana parish. The 1980 program continued into 1981, under volunteer leadership of Earlena Crammer, and volunteers reach 73 percent of the students. For additional reinforcement of their energy concepts, volunteers carry coloring books to distribute to the youngsters. They also added new concepts for the third graders they had visited the year before: how to read thermostats so room temperatures can be checked, opening draperies in cold weather when the sun is shining, and closing draperies in summer to keep out the heat.

Six weeks after presenting programs in the schools,volunteers and Extension staffers followed up on some of the students to see how much they still remembered. About half the children were closing doors quickly to keep out heat or cold, dressing appropriately for the weather, and helping to plan car trips to do more than one errand at a time. A third of the youngsters were opening and closing window coverings to conserve energy and turning off the television and lights in rooms.

Extension staffers and volunteers also found through followup that their programs are right on target for their primary audience—second-graders— when they learned that first- and third-graders they'd also worked with weren't remembering as well as the second-graders were. So, a start has been made toward the long-range goal of helping children establish energy-saving habits while they're young.

The clown concept could be spreading. Betty Wood reports thatt she's been asked to send material on the Enerjean project to people in several other states. Enerjean will continue to take her energy-saving message to second-graders in 1982. Clearly, clowning around can save energy!



Grassroots Governments Plan Energy Conservation

The cost of energy is a twofold problem for local communities. First, local governments face problems of obtaining and financing energy supplies for their own service and operations. Second, local governments, as the level of government most involved with people in their daily lives, must share in the responsibility of dealing effectively with their citizens' own energy problems.

With active grassroots citizen participation, local governments can effectively develop and implement their own energy policy and programs. In Maryland, the Cooperative Extension Service is helping communities educate their citizenry in this critical issue.

Maryland has a relatively small number of local government units: 23 counties and 152 incorporated municipalities. These jurisdictions encompass a variety of organizational arrangements, but all of them retain local responsibility for implementation of functions and services under the broad policy and legislative guidelines of the state. Although local governments vary in the particular power each possesses, they can control or influence a variety of decisions affecting energy use. These energy-related areas include land use and development patterns, energy use in buildings, community outreach, local energy production, transportation, and local government internal operations.

In 1977, officials from Prince Georges County asked Bruce Sorter and Jack Lancaster of the Cooperative Extension Service Community Resource Development faculty to assist them in developing a county energy program. The County Energy Conservation Council, chaired by the county energy coordinator, was actively involved in the process. The final plan contained five major areas to be addressed by energy conservation planning: residential, commercial, industrial, transportation and the public sectors. According to Prince Georges County records, the plan saved approximately $1.3 million in energy costs over a 2-year period. Equally important is the continued involvement and enthusiasm of local citizens in the program.

Cooperation

Between 1979 and 1981, the state energy office paid the University of Maryland $430,000 to provide technical assistance to local governments. Under Extension faculty leadership, the Energy Technical Assistance Program (ETAP) became a cooperative effort of the University's College of Engineering, the Maryland Technical Advisory Service, and the Cooperative Extension Service. Over the 2-year period, ETAP assisted businesses, local governments, community groups, and the Energy Extension Service. Types of assistance to local governments included workshops for local officials, compilation of a handbook, and direct technical assistance to 28 municipalities. During the 2 years, it became evident that local governments were not able to handle their energy problems alone.

ETAP and the Prince Georges County's success started many people on the Extension CRD faculty thinking: "What is the role of

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Cooperative Extension Service in local community planning?" Surely, the staff could not expect every jurisdiction to save a million dollars in 2 years—many don't spend that much on energy to begin with! But CES can and does play a valuable role in educating both citizens and governments in the local issues. Through a decisionmaking process, CES can assist governmental agencies in developing local solutions to their energy problems. In the past few years, the Extension CRD staff has found that this assistance takes on a variety of forms but is always educational in nature and cooperative in spirit.

Energy Futures Conference

After several years of conducting successful energy projects such as fairs and workshops, the Frederick County Maryland Extension committee wanted to tackle the larger issue—a comprehensive community energy program. Under the leadership of CRD agent Mike Sowell, the committee investigated various approaches to the problem, and decided an energy futures conference was the best way to start the ball rolling. A 2-day conference highlighted the problem and secured the commitment of key individuals to work on a countywide program.

The first night of the January 1982 conference was open to the general public, and keynote speakers addressed the energy problem. The second day of the conference was given over entirely to work sessions. Eight invited groups, with the aid of facilitators, identified priority energy issues in transportation, land use, economic development, recycling and waste utilization, farm and food production, institutional energy users, emergency preparedness, and housing. By the end of the day, each group outlined their plans to tackle these issues. When participants left the conference, their work had just begun.

Energy Forum

Coordination and communication were the problems in Wicomico County. George Monroe, Wicomico Extension agent, met with the Regional Coordinator of the Maryland Energy Office and the Wicomico Energy Coordinator to discuss the situation. They decided to form a loosely organized group called the Wicomico Energy Forum to keep current on energy issues, know what alternatives are available, and coordinate programs.

The Forum is now seeking to identify the large energy users in the county, as well as citizen and organization leaders interested in the energy issue. The group mailed a short questionnaire to 200 potential members. The Forum will offer a series of activities designed to highlight ongoing education programs and eliminate duplication and competition. As the need dictates, study groups will be organized to address complex energy questions. CRD faculty will assist these groups in their decisionmaking process.

Citizen Committee

In rural Allegany County, the energy situation seemed to be unmanageable. Short of resources and staff time, the county could barely keep up with the regular workload. Energy was a problem, but it was going to have to wait. Then in June 1981, Trish Driscoll took on the assignment of local CRD agent with responsibility for the energy program. As part of her needs assessment, Driscoll contacted all related agencies and groups. To assist with coordination, she compiled an Energy Reference/Referral Notebook which was placed in all libraries and community centers.

In the fall of 1981, a county official asked for her help in energy conservation programming.

Driscoll is now in the process of members for a recruiting committee to spearhead this effort. The initial job will be to educate the general public, as well as local government officials, to the problem. The long-term goal is to implement a comprehensive county program.

The energy problem in Maryland is far from being solved, but the effort proceeds—sometimes smoothly, sometimes not—toward the establishment of local, educated citizens groups working with the support and mandate of the local government to solve of community energy problems.

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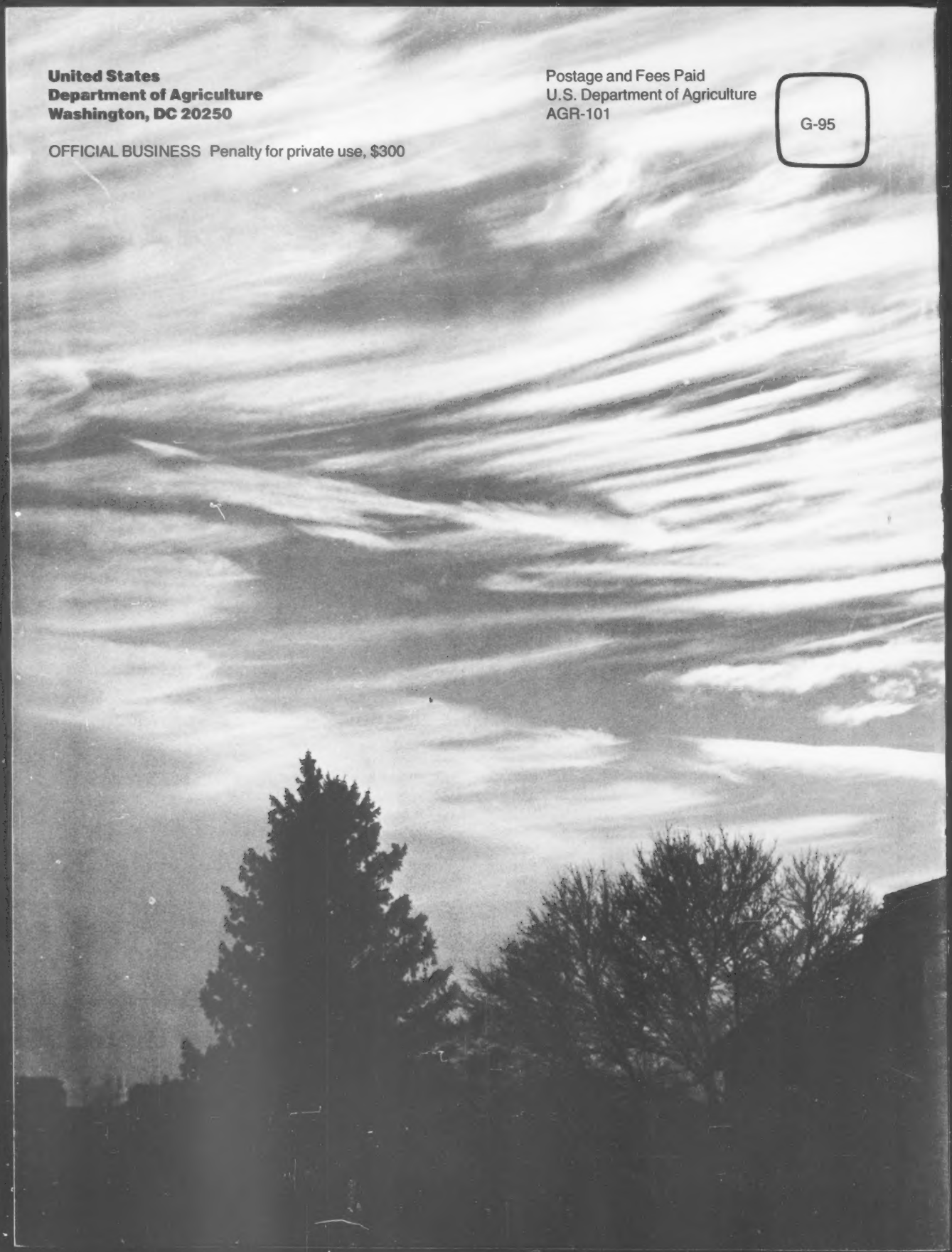
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